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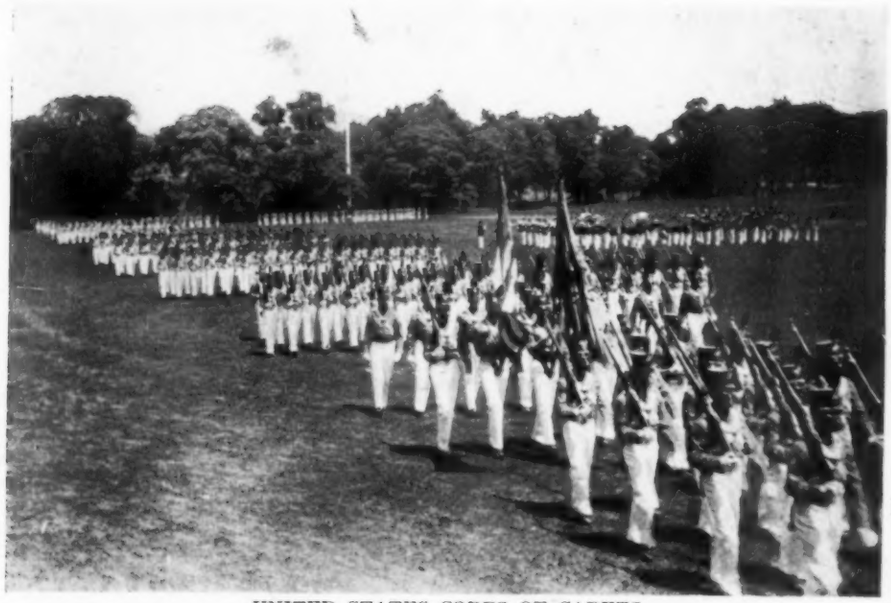

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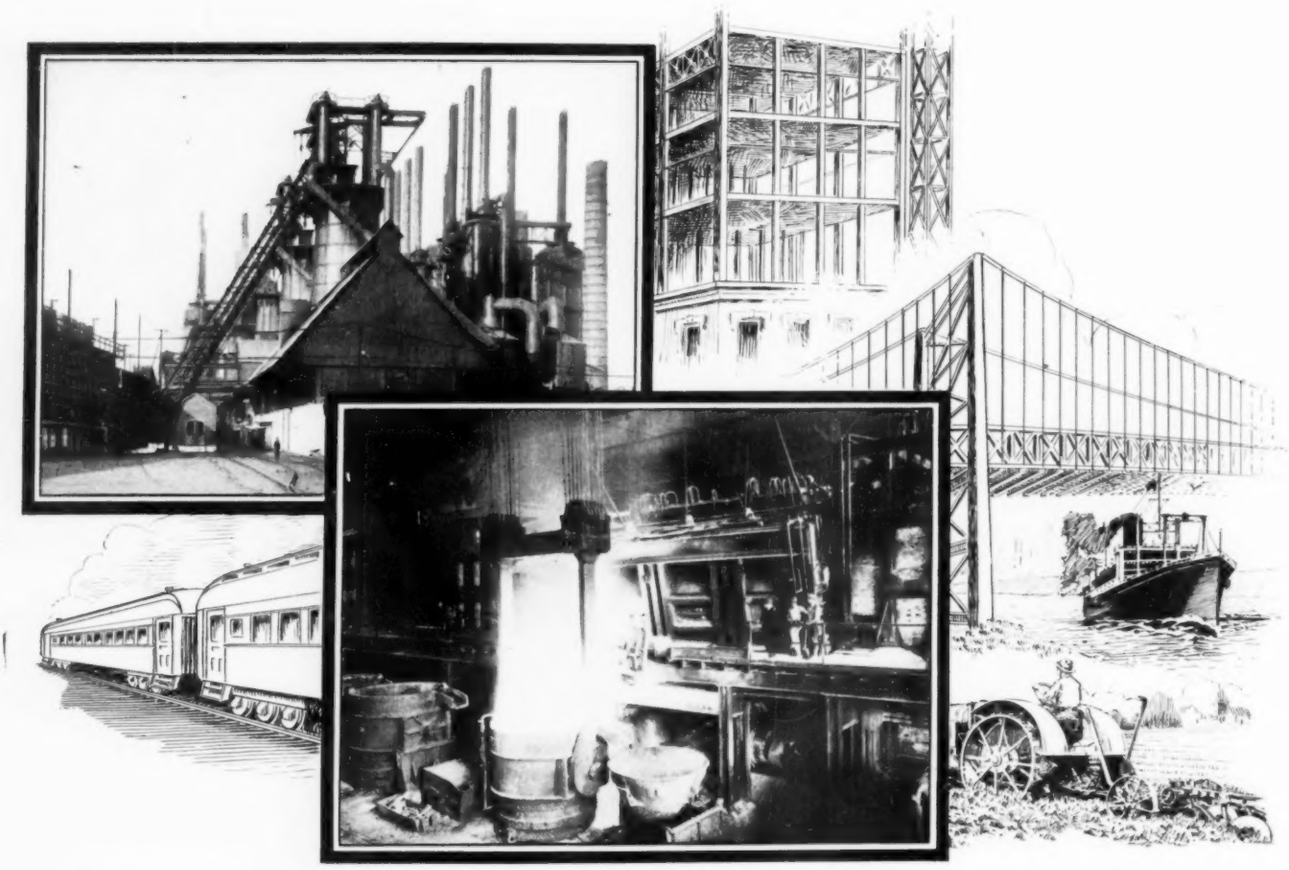

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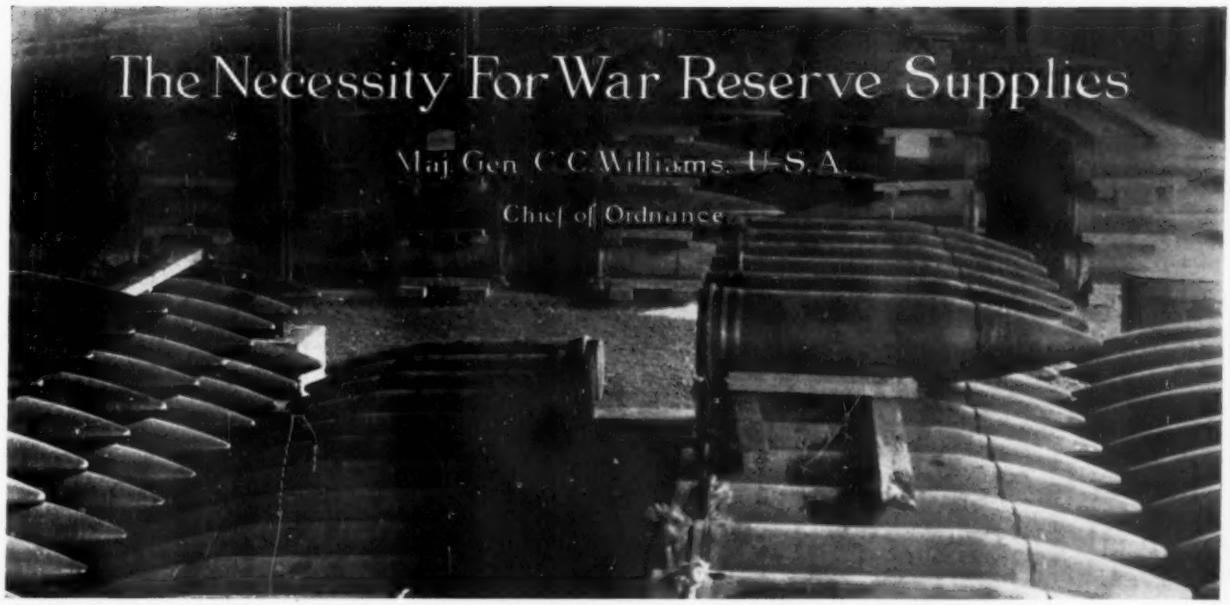
The Necessity For War Reserve Supplies

Maj Gen C C Williams, U S A
Chief of Ordnance



MOST people will readily agree that it is the mission of the War Department in time of peace to keep the country acquainted with the arrangements necessary for producing an effective army in time of need. Unfortunately, many are of the belief that if there is a proper nucleus of soldiers in the organized forces to hold the enemy until the non-organized citizens of the country can be mobilized in sufficient numbers the problem has been solved. Even a casual study will show us that this conception of national preparedness is only partial and that true preparedness requires in addition adequate arrangements for supplying the man-power army with necessary supplies and fighting materials. Many cases in world history corroborate this latter conception and the experiences of the World War still further emphasize it. In this article I want to give a partial outline of the supply preparedness problem and the steps necessary for its solution.

Every one who really thinks about it realizes that a soldier must be clothed, fed, transported and supplied with fighting materials. But it apparently seems to be the general feeling that all of these will be available to the Army when needed. In other words, it is assumed that the supposedly limitless resources of America can be relied upon to care for the Army's every need as and when desired. If this assumption were correct, the problem of preparedness would indeed be simple and our only worry would be with reference to the availability of man power. But unfortunately it is not so in the present state of the art of war.

The problem of supplying an army with food, clothing and weapons has perhaps undergone a greater change through the ages than has the problem of placing soldiers on the field of battle. In the early days of human history, supplies and weapons were not of a complicated nature but were in fact the regular products of every day life. Each man was always armed and was always ready to defend himself. War was essentially a hand to hand, or man-power struggle. Preparedness required only arrangements for the availability of fighters. But developments of great numbers and importance have taken place through the many centuries of human progress in chemistry, metallurgy, mechanics, electricity, etc. There has been corresponding progress in the application of such scientific developments to the machines of war; however, this has added to the complexity of the problem.

We all know of the changes in weapons of war, from the natural implements of the Stone Age,—rocks and clubs, to the slings of Biblical times, the armor, spears and battle axes of the Romans, the halberds and pikes of the Crusaders, the simple powder and guns of the thirteenth century, and, finally, to the present day status with guns varying in size of bore from approximately ⅛ inch to 16 inches in diameter, in weight from 8½ pounds to 170 tons, and in muzzle energies from 2,450 ft. lbs. to 118,247 ft. tons; ammunition with projectiles and fuzes so sensitive as to explode upon impact with

DISCUSSION BY HON. DWIGHT F. DAVIS, SECRETARY OF WAR

I HAVE read with great interest General Williams' excellent article on the material side of national preparedness. During two and one-half years as Assistant Secretary of War, a large part of my time was devoted to doing what I could towards avoiding, in any future conflict, the terrible military consequences of lack of equipment and munitions of war. I feel that a great deal has been done to accomplish this; but I do not believe that professional opinion yet fully realizes the prime importance of the development of military matériel.

I am not sure, however, that General Williams is right when he says that the country is more willing to spend its funds on training personnel than it is on developing and maintaining reserves of matériel. While that statement is perhaps true today, I believe that, upon such a question, the country would probably be willing to follow the opinion of the military profession. It is, therefore, towards the indoctrination of their own comrades with the importance of procurement planning and of accumulating reserves of matériel that the efforts of officers who agree with General Williams should, for the present, be directed. Once the men who are to command armies in the field realize that, if there are not in force programs for the procurement of reserve supplies, training programs are a mere waste of time, the material preparedness which General Williams desires will readily gain public approbation.

Dwight F Davis

DWIGHT F. DAVIS,
Secretary of War.

DISCUSSION BY MAJ. GEN. FOX CONNOR, U. S. A., DEPUTY CHIEF OF STAFF

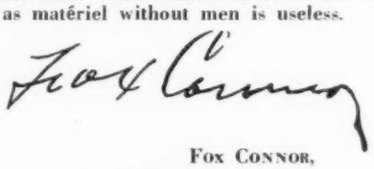
I HAVE read with much interest the article by General Williams appearing in this issue of Army Ordnance. General Williams brings out very clearly that any force we maintain must be balanced in men and munitions. It is doubtful if any other force is worth the money expended on it.

Virtually no complete rounds of American-made ammunition were fired at the enemy from the more important artillery calibers during the nineteen months and five days we were engaged in the World War.

The Chief of Ordnance well points out that in the next war we may not have allies to hold the line and furnish us munitions while we prepare.

The Congress has recognized the need for war reserves and has authorized such reserves as may be necessary for one million men. Naturally the War Department deires to keep the reserves to the lowest safe limits. Any other course would be uneconomical and wasteful even though it were financially possible. In fixing the reserves the lowest safe consumption rate has been assumed and credit, month by month, has been taken for all production that can be anticipated. As a consequence, our established ammunition reserve is quite comparable to the actual expenditures in the one battle of the Meuse-Argonne. This is certainly a small amount when we consider that approximately one year is needed to get into reasonable quantity production of ammunition and that we cannot undertake even the training of men over and above one million until quantity production is attained. For the first time, the Budget for 1927 contains several million dollars for protecting our ammunition reserve. This means that the President, the Director of the Bureau of the Budget, and the Congress, as well as the War Department, realize the necessity for the War Reserve. This in turn means a hopeful outlook for the future. But the necessity till exists of a complete and thorough understanding, not only in the Regular service but throughout the country, of our vast munitions problems.

I believe that it is the especial duty of Ordnance officers to stress the truth—Men without matériel are at least as helpless as matériel without men is useless.



Fox Connor,
Major General, U. S. A.,
Deputy Chief of Staff.

the fabric of a dirigible, or so inert as to penetrate heavy ship's armor and then explode, ammunition that shows its path through the emission of smoke by day and fire by night, ammunition varying in weight from 395 grains per round to 3,150 lbs. per round; powder that will burn in a gun without showing any flash at the muzzle, powder so insensitive to water that it will soon be no longer necessary to follow the latter part of the old maxim "Trust in God but keep your powder dry"; bombs varying in size from a few pounds to 4,000 pounds, and so designed and fuzed as to explode when they strike water, land, houses or ships; gases that make you sneeze, laugh, cry, blister, or die; tanks that need no roads, can bowl over trees that stand in their way, some types that can even swim; and, finally, aircraft with its tremendous possibilities.

Today, therefore, our war machines are in many instances very complicated and some are of a special character quite dissimilar to the peace-time products. They have such power of destruction and are able to transfer this power of destruction to such great distances that the physical strength of man is of itself unable to cope with them. As a result, the soldier is today in effect an operator of a war machine. He is as dependent upon his machine for the accomplishment of his mission as a machinist is upon his lathe, a chauffeur upon his automobile, or an engineer upon his locomotive. Certainly no one would fear an air force without planes and bombs, artillery without guns and ammunition, or infantry without rifles, machine guns and ammunition therefor. These war machines are not only complicated and of many types but the quantities required by an army in present day warfare are colossal.

Let us consider how much artillery ammunition we need to fight a modern battle. In the history, *How America Went to War*, written by Benedict Crowell, the Assistant Secretary of War and Director of Munitions, 1917-1920, now President of the Army Ordnance Association, and Robert Forrest Wilson, the authors give a table on the expenditure of artillery ammunition in modern battles, as follows:

Year.	Battle.	Days' Duration.	Army.	Rounds of Artillery Ammunition Expended.
1863	Chickamauga	2	Union	7,325
1863	Gettysburg	3	Union	32,781
1870	St. Privat	1	German	39,000
1904	Nan Shan	1	Japanese	34,047

(Signal Corps, U. S. A.)

Guns and Howitzers at Base Ordnance Depot, No. 4, St. Sulpice, Gironde, France, January, 1919.

Year.	Battle.	Days' Duration.	Army.	Rounds of Artillery Ammunition Expended.
1904	Liao Yang	9	Russian	134,400
1904	Sha Ho	9	Russian	274,360
1915	Neuve Chapelle (1)	3	British	197,000
1915	Souchez (2)	1	French	300,000
1916	Somme (3)	7	British	4.000,000
1917	Messines Ridge (3)	7	British	2.753,000
1918	St. Mihiel (2)	4	United States	1,093,217

(1) Artillery preparation lasted 35 minutes.
(2) Artillery preparation lasted 4 hours.
(3) Artillery preparation intermittent 7 days.

The footnote to this table says:

"One of the most striking developments of the recent war was the great increase in the use of artillery to precede infantry action in battle. This is illustrated by a comparison of the expenditure of artillery ammunition in characteristic battles of past wars with that in important battles of the war just ended. The special features of the several battles should be kept in mind. Chickamauga was fought in a heavily wooded region; Gettysburg and St. Privat over open farm land. The latter battles, together with Nan Shan, and all the battles of the World War considered above, involved artillery preparation for assault upon armies in defensive positions. The expenditures, therefore, are roughly comparable.

"The high mark of the use of artillery in offensive battle was reached at the Somme and Messines Ridge, before the effective use of tanks was developed."

During the whole of the Civil War, from 1861 to 1865, the authors point out, 5,000,000 rounds of artillery ammunition were expended by the Union Army. That was one of the greatest wars of history, previous to the recent war. In the Franco-Prussian War, the German Army expended 817,000 rounds of artillery ammunition. In the Russo-Japanese War, the Russian Army expended 954,000 rounds of ammunition. Compare these figures with the recent war when 12,710,000 rounds of artillery ammunition were expended in one month by the French and English armies.

Many instances could be cited to show how impotent have been armies inadequately supplied when in conflict with armies better supplied. The first battle of an American Army, Bunker Hill, was one. We were victorious against the foe while we had "powder and ball," but as

DISCUSSION BY MAJ. GEN. H. E. ELY, U. S. A., COMMANDANT, THE ARMY WAR COLLEGE

POSSIBLY never again will we have an allied force to stay the enemy until we can mobilize manpower and industry to give effective results though at the sacrifice of economy. The country should be kept informed as to what the War Department is doing to correct those errors of the past war due to lack of preparedness. Not only should the American public look upon the needs of our Army in time of strife, but their effect on industry and labor—those commodities necessary for the well-being of the populace not actually engaged in the conflict.

In reading General Williams' article it must be kept in mind that Ordnance is but one phase of preparedness. Many other supply and operating branches of the War Department machine must be borne in mind. Not in any war have we ever had sufficient ammunition and if we did have the ammunition, it is very questionable whether transportation requirements would meet the demand for its distribution. We keep abreast with the developments of science in all the arts of war. This is but a sensible policy of economical preparedness. The time will never come in these United States when people will permit the assessment of a tax which will warrant the maintenance of large reserve stocks.

It must be realized, as it was in the latter part of the World War, that not only are the soldiers who are actually engaged to be considered as the fighting force, but every one swearing allegiance to the United States can be and must be utilized in some capacity, if that capacity be only one of readiness.

The Ordnance Department is to be commended that it is endeavoring to place before the public the necessity for adequate preparedness and with the assistance of such enlightening articles as the one prepared by General Williams, the country will learn some of the needs of the War Department. Man is still the dominating factor in war but unless matériel is available in proper quantity of the proper kind and at the proper place, many lives will be needlessly sacrificed and possibly battles, campaigns and even wars lost.

H. E. ELY,
Major General, U. S. A.,
Commandant, The Army War College.

Ammunition Dump at Maison Rouge, near Verdun, January, 1919. (Signal Corps, U. S. A.)

(Signal Corps, U. S. A.)

Ammunition Reclamation Depot No. 1, Mauvages, France, December, 1918.

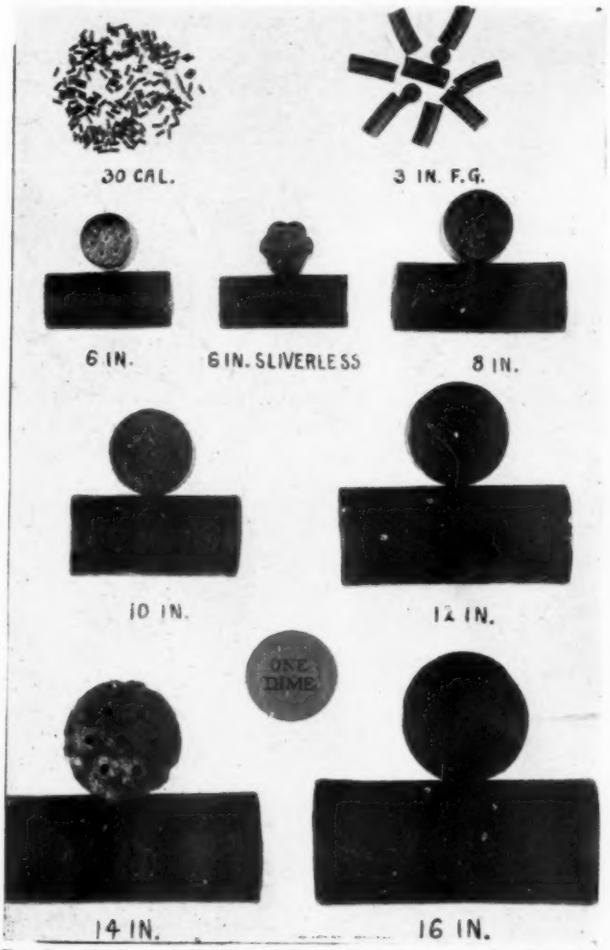
(Signal Corps, U. S. A.)

Quarry at Grande Rattentout, Meuse, France, served as Field Ammunition Office for the 1st Army, January, 1919.

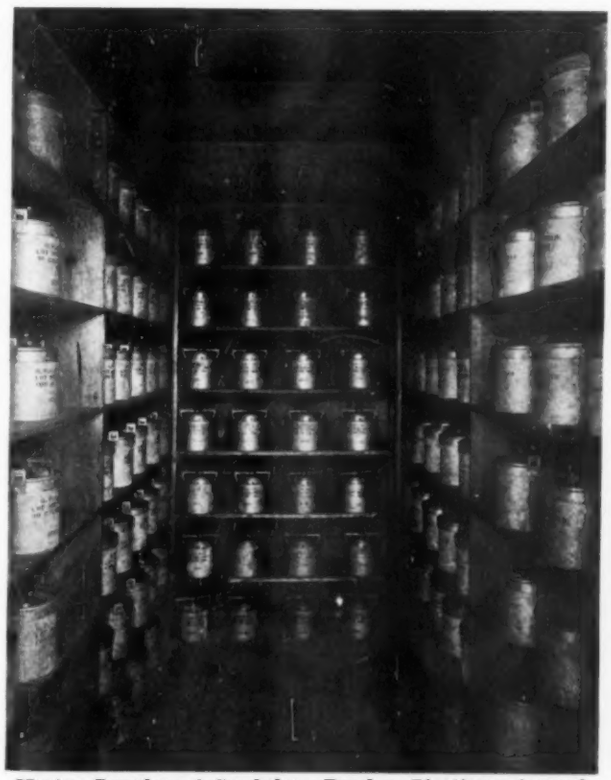
soon as the meager supply was exhausted we had to retreat and surrender the field to the British. In the World War we know how helpless was the Russian Army because of its lack of fighting materials. The inevitable result of the Russian effort to overcome, by means of the strength of flesh, the strength of metals and chemicals available to their enemy, was the slaughter of Russian soldiers to no avail and the consequent withdrawal of the Russian Army. Napoleon stated the problem very simply but comprehensively when he said, "God is on the side having preponderance of artillery." It seems, therefore, axiomatic that in time of war the fighting forces of one nation must have munitions of a quality and quantity equal to those available to our probable enemy.

To achieve a solution to the quality phase of the problem requires that we keep constantly in touch with the developments of science and their applicability to war machines, and be constantly able to produce fighting materials which are at least the equal of those available to the enemy. The country, the Congress, and the Army have adopted, through years of appropriations and work, the policy of keeping the Army abreast of the times from the standpoint of design of war materials. It is believed that the results are satisfactory.

To achieve a solution of the quantity phase requires that we have on hand at all times stocks of essential supplies in ample quantity with which to furnish our Army until



Powder Grains of Various Sizes—"Guns are as hard to fit with powder as feet with shoes."



Master Samples of Smokeless Powder, Picatinny Arsenal, Dover, N. J. Tests indicate the average "life" of smokeless powder to be 16 years if stored under ideal conditions.

replenishments are adequate. This is the part of supply preparedness that has been neglected in the past and will be neglected in the future unless we admit its necessity and agree, year after year, to provide for it.

It is obvious that if we could produce supplies of all kinds as rapidly as our Army would need them during mobilization, training and battle, it would be unnecessary to keep reserve stocks at all. This would be the ideal solution, because it must be admitted that the development and maintenance of large reserve stocks of munitions is a heavy financial burden. That is undoubtedly one of the reasons why it has been neglected in the past.

As a general proposition the country is more willing to spend its funds on training personnel and furnishing them with necessary current supplies than to spend funds in time of peace in developing and maintaining reserves of fighting materials which, because of their obsolescence, might never be used in time of war. In the latter case it seems to feel that the money is wasted, while in the first instance, even though the Army is not called upon to fight a war, the country sees it and appreciates its presence.

There is no doubt but that we should make every effort to keep our reserve munition stocks to the logical minimum that will assure adequate supply. It is the economic and sound solution. It can only be done by being as fully prepared as possible to expedite production in the event of an emergency.

Congress in the National Defense Act made definite provisions for the assurance of adequate arrangements for industrial mobilization in case of war by delegating that particular mission to the Assistant Secretary of War. A

nationwide organization has been set up for the purpose of meeting, to the best of its ability, that responsibility. It is believed that much progress has been achieved and that the supply time factor, or the time required to place contracts, manufacture the material, and deliver the same into the hands of the fighters at the front, has been materially shortened.

(Signal Corps, U. S. A.)
Battery A, 324th Artillery, 158th Brigade, Cote de Roche, Meuse, France, October, 1918.

But in spite of all efforts along this line, it will be impossible to eliminate the necessity for reserve stocks in some of the essential items. This is because, in my opinion, it is far easier from the standpoint of time to mobilize, train, and place upon the firing line our men than it is to produce and deliver to them material with which to fight. For complicated items, such as large guns and airplanes, this time differential amounts to some 18 months and, on the other hand, it practically disappears in simple items. For ammunition it amounts in round numbers to 12 months.

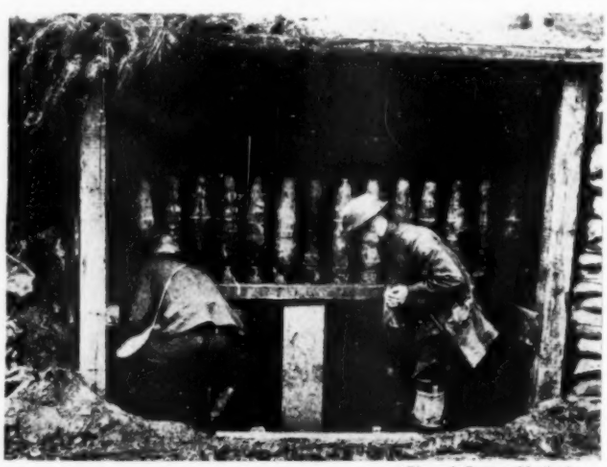
The lack of appreciation of this time factor was the cause of much unjust criticism during and since the World War. The country seemed to feel that as soon as funds were appropriated the materials desired should be immediately available. It did not seem to realize that there was no established industry in the country for the manufacture of such an item as airplanes, and that in order to produce them in quantity materials had to be gathered from the various parts of the United States, including the cutting of special woods in the forests of Oregon and their drying and preparation for assembly, the production of special silk cloths in New England, motors in Detroit, special instruments in New York, and, finally, all these and more had to be assembled into units, tested and delivered to the users either here or abroad. These things cannot be done overnight. Even now we estimate it would take some 12 to 18 months to produce airplanes in quantity, and it was not fair to expect that the country could achieve quantity production nearly so rapidly in the days of the World War. The country had, therefore, little right to expect that airplanes could be produced and delivered in any appreciable quantities to the air forces in France before the Armistice.

The cry is also made that we had to fight the World War with guns and ammunition obtained from the Allies. This, too, is substantially correct. In all fairness we should likewise admit that this also is only what we had a right to expect. We started the war with practically no stocks of guns and ammunition. To make artillery in quantity and deliver it to the front in France requires, with reasonable speed, some 18 months, and from April, 1917, to November, 1918, is 19 months.

We must not forget the many months of dire need in which the English Army found itself, in the early part of the World War, in the matter of guns and ammunition, and the very stringent restrictions used by them to conserve their practically starvation rations of ammunition in order to have a little available for a possible supreme test. Nor should we forget the practically open and unlimited pocketbook with which she persuaded many American industries to forsake their regular business and bend their every effort to the manufacture of powder, explosives, ammunition and guns, to augment their own production in order to give their fighting forces an adequate supply of fighting materials.

Fortunately, the items of which appreciable stocks must be maintained, developed or replaced, are relatively few in number. Many are so similar to industrial peace-time products that production in the event of war will be adequate. In others such as certain types of guns, there is now an adequate stock remaining from the World War which it is believed will remain available for many years and which it will not be necessary to replace in quantity until probable enemies are rearming their forces with better weapons. However, some manufacture of new types to develop production methods and for extended tests by troops will be necessary. Probably the most important items for which stocks must be developed or replaced, are aircraft, ammunition and propellants, and a few raw materials such as nitrates.

Propellants are a typical example. In days gone by the propellant used by the Army was black powder and was similar to that used by industry. The problem was then simple. But today the propellant used by the Army must be of a special character and has very little in common with the "sporting" powders used in rifles and shot guns. The composition of powder has a very marked effect upon the rate at which the barrel of a gun erodes. If military powders were made of the same composition as "sporting" powders, the number of rounds that could

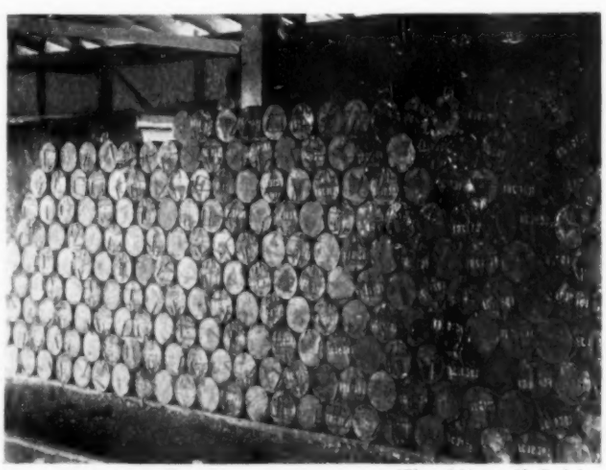


(Signal Corps, U. S. A.)
Storing Ammunition in a Front Line Dugout "Somewhere in France," 1918.

be fired before the gun became so eroded that its accuracy was spoiled, would be very much less. Even military powders are not interchangeable from the standpoint of size. Each type of gun must have its particular size of powder grain. For the caliber .30-inch rifle the grain is approximately one-tenth of an inch long and has a diameter the size of a pin. For the 16-inch gun, the grain is approximately 3 inches long and has a diameter in excess of 1 inch. Guns are as hard to fit with powder as feet with shoes. As a result, the manufacture of military propellants is a highly specialized task with very little counterpart in the industrial life of the nation.

At the close of the World War we were left with large stocks of propellants. But these have a very limited life. If powder is carefully made it may last some twenty years before it deteriorates sufficiently to become dangerous; if not, its life is much less. Most of our stocks are of World War manufacture and some were not carefully made. Because of these stocks, which are now quite rapidly disappearing, the Government has purchased practically no powder and consequently the art of its manufacture is dying out. If a reasonable quantity of powder were manufactured each year, our stocks would be satisfactory both as to age and quantity, so that we would have something with which to fight in the early months of a war. In addition, the art of manufacture would be kept alive to a reasonable extent, and this would have the very important advantage of increasing the dependence upon industry in time of need, and of reducing the quantity of stocks that should be kept.

At the present time even the target practice requirements of the Regular Army for ammunition are provided by taking this ammunition from the existing war reserves and not from appropriations by Congress. The value of this ammunition used each year is somewhat less than ten million dollars. If the Congress should see fit to appropriate each year this sum for the maintenance in serviceable condition of the war reserve of ammunition, a suitable reserve could be adequately maintained by the Army



(Signal Corps, U. S. A.)

Cartridge Storage Cases in Warehouse No. 4, Mehun-sur-Yevres, France, December, 1918.

using the older ammunition, and using the funds appropriated by the Congress for the manufacture of new ammunition. The point I am making is that if Congress should start now paying for target practice ammunition

(Signal Corps, U. S. A.)

145th Field Artillery preparing gun and ammunition for action, Esnes, France, October, 1918.

as it is used, an adequate war reserve of ammunition could be maintained.

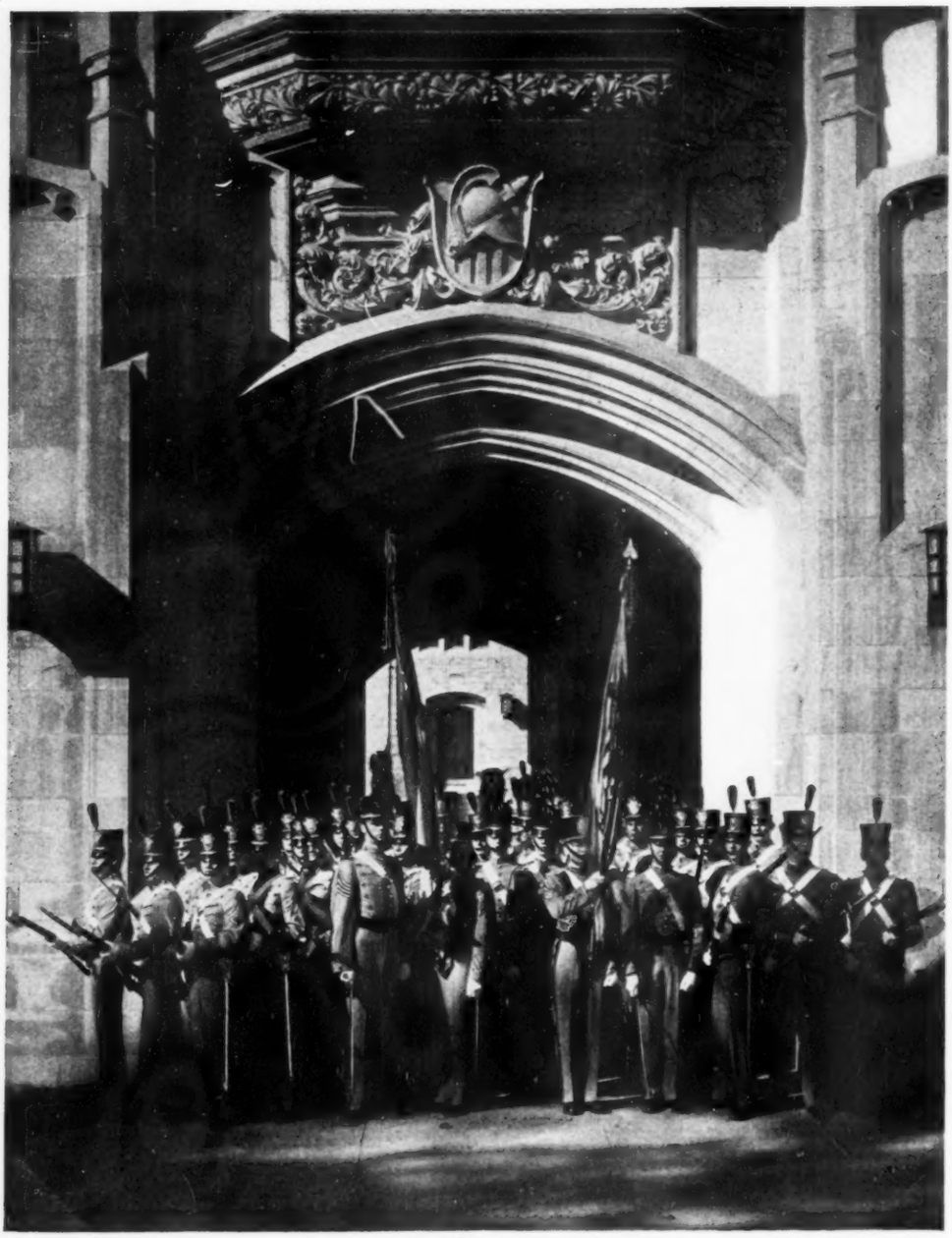
The sound solution to the problem requires that sufficient funds be made available year after year to provide the smallest army which we believe is necessary to the country's defense with an adequate supply of essential fighting materials and supplies until production is sufficient to meet needs.

If the budget limit placed upon the Army is not sufficient both for this minimum army and its necessary reserves of supplies, then the only sound and honest solution is to so coordinate the strength of men and materials as to produce the maximum combined strength within the limits placed.

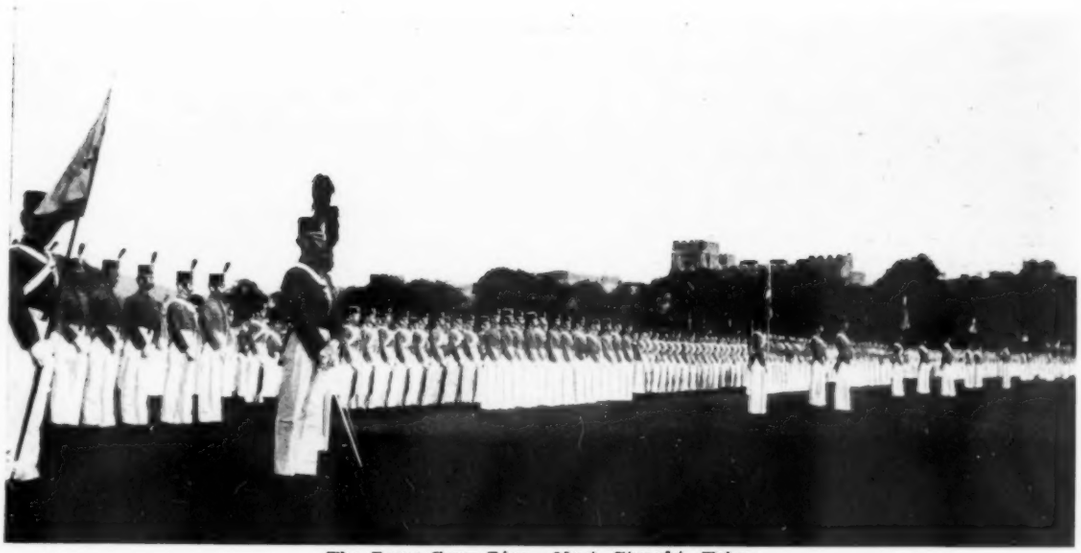
Lieutenant General Sir John Monash, Commander of the Australian Forces in the World War, has this to say with reference to preparedness:

> "The nation that wishes to defend its land and its honour must spare no effort, refuse no sacrifice to make itself so formidable that no enemy will dare to assail it. A League of Nations may be an instrument for the preservation of peace, but an efficient Army is a far more potent one.
>
> "The essential components of such an Army are a qualified staff, an adequate equipment and a trained soldiery. I state them in what I believe to be their order of importance, and my belief is based upon the lessons which this war (World War) has taught me.
>
> * * * * *
>
> "Such a creed is not militarism, but is of the very essence of national self-preservation."

In conclusion I want to point out that we hand a very unfair heritage to posterity if we fail to provide a fair solution to the supply problem of an army when we know full well that an army cannot fight without supplies and that it takes longer to produce important materials than it does to produce soldiers. Posterity must inevitably fail to approximately the same extent that we failed in supply in the World War. And then we may not have allies on which to lean. Let us constantly remember that if we are inadequately supplied with fighting materials, no preponderance of soldiers with countless lives sacrificed will win the battle.



Guide us, thy sons, aright,
Teach us by day, by night
To keep thine honor bright,
For thee to fight.
When we depart from thee,
Serving on land or sea,
May we still loyal be,
West Point, to thee.



The Long Gray Line—Alert, Straght, Trim.

West Point Training—An Appreciation

Clayton Earl Wheat, Chaplain, U. S. Military Academy

THE average visitor to West Point sees the exterior of the life there, the splendid military set up of the Corps, its smart uniform and equipment, its faultless precision at drills and parade, its ceaseless round of academic duties and professional activities, or he sees the physical attraction of the place, the magnificent buildings which blend harmoniously with the surrounding hills, the drill and parade grounds, the athletic stadium, the historic old Fort Putnam, the Cadet Chapel on the hill which dominates the plain below, making vivid the psalmist's graphic words, "I will lift up mine eyes unto the hills from whence cometh my help"—all these he sees and in his admiration of these things which please the eye, he thinks that he has seen and appreciated West Point.

But to understand and appreciate the real West Point one must penetrate this exterior phase of its life and get down to the underlying spirit of which the outward display is but a surface indication, and this is most difficult to do, for young men are not given to parading their ideals and motives, their code of ethics and behavior, for public inspection or analysis. They would prefer to have their ideals wrongly interpreted than to give any semblance of wearing them on their sleeves for public view. One must live in the atmosphere of the place in order to catch that indefinable spirit which characterizes the life at West Point and leaves its indelible impression on the graduate for life.

One of the fundamental characteristics of the life of the Crops is its absolute democracy, the parity of opportunity, purpose and privilege which is to be found here. The casual observer might think that because of the strong feeling and sharp distinction between the upper classmen and the plebes, that clannishness and cliques would abound, but nothing could be farther from the truth. The Corps of Cadets is, without doubt, one of the most democratic bodies of men in the world, for there is complete equality of opportunity and privilege regardless of all the antecedent conditions of the life of the individuals. Our nation has a world-wide reputation for its melting pot proclivities, in trying to fashion into one united people the multitudes brought here out of many kindreds and tongues. The formation of the Corps of Cadets is the example par excellence of all melting pots. Here you will find the most diversified heterogenous material imaginable being moulded into a uniform unvarying homogenous body. The new cadets come from every strata of life in the land—from every sphere of influence and environment. They are a cross section of the people of the United States, and quite naturally they bring with them a conglomeration of customs and conventions, ideals and traditions. Some have had the most careful home training, others have had slight advantages in this regard. This is the ore which goes into the melting pot, out of which comes the refined product, and the secret of the whole process by which the metamorphosis is made is found in the complete equality of opportunity for all—no favors or handicaps, no advantages or hardships which are not equally shared by every cadet. The new cadet's antecedent conditions are not taken into consideration. His father's achievements or the lack of them have no bearing on his chances for advancement, which is based solely upon merit and efficiency, upon the man's inherent worth, upon what he himself is and not upon what he may have been in the past or his father may have been before him. This spirit of democracy is furthered by doing away with the distinctions and barriers which money creates. No cadet can receive money from home. His monthly pay is his sole source of revenue. Thus each man is on an equal financial footing.

But with these various provisions for democracy and equality, it would not be a success were it not for the backing of the Corps. The regulations of the Academy contemplate a complete parity of opportunity, social, financial and professional, but it is the will of the Corps which gives substance and force to the regulations.

It has always been one of the cherished traditions at the Academy that every cadet enters the race here as a scratch man; no handicaps, no favors, no advantages or disadvantages which are not imposed on all; every man on an equal footing, with his own way to make; with nothing to see him through but his own ability, energy, and determination, and the best man wins, not because of any influence or prestige which his family name might exert, but simply because he is inherently the best man.

Raw Material Reporting at West Point to Emerge After Four Years Trained for "Duty, Honor, Country."

It is this attitude of judging a man's worth by what he is and does, rather than by what he has, which fosters the spirit of democracy at West Point and enables the Academy to mould the most diverse material, into that type of man whose scale of values emphasizes inherent worth rather than inherited claims, stresses demonstrated ability rather than antecedent prestige.

The Academy motto, "Duty, Honor, Country," is enshrined in the heart of every West Pointer. The daily routine of the cadet's life where each hour of the day has its appointed task and responsibility, impresses upon him the significance of the phrase, "Do it now and do it right." Four years of this rule of unvarying attention to every detail of duty makes the practice a habit in after life. As Honor is the central virtue in the Academy's motto—being attended on either hand by Duty and Country—so does it occupy the chief place in the regard of every cadet. It is the soul of the Corps—the very life of its existence. Honor in the Corps is based on the good old-fashioned tradition that an officer must also be a gentleman, with all the virtues and qualities which that term connotes. Anything that is not included in the code of ethics of a gentleman is taboo in the Corps—quibbling, evasion, flavor of sharp practice, shading and paring of the truth, these are not tolerated in any form. There is no haziness or uncertainty as to what can or cannot be done in matters which involve honor. The line of cleavage is clear cut and an intentional breach of honor or violation of the truth are held inexcusable. Now the reason for this emphasis upon the individual's integrity is that the violation of a cadet's honor is a smear on the honor of the Corps and that is not tolerated in any form. In safe-guarding and keeping inviolate the honor of the Corps, the individual members of the Corps must speak the truth spontaneously—must think as well as act on the square without having to stop and consider it. It is not the welfare of the individual which is at stake, but the honor of the Corps, which must be kept untarnished and unsullied at all costs. This inherent love of the truth is as firmly imbeded in the life at West Point as the surrounding hills are a solid part of its scenery. The hatred of a lie and the abhorrence of all that is false are deep rooted in the place. This innate love of truth and the abomination of a lie may trace their origin back to those trying days of the Revolution when Benedict Arnold by his duplicity and perfidy almost succeeded in betraying West Point to the enemy. Ever since that day, the strongest emphasis upon whatsoever things are true and honorable and of good repute has been innate in the atmosphere of West Point.

To sum up the activities of the Corps under the third obligation in the motto "Country"—would be to enumerate the names of that long line of graduates who have given themselves in loyal service to their land—both those whose names and faces are familiar wherever deeds of valor and renown are sung, and, also, the names of "the men of the Corps long dead." Here would pass in review the thousands of devoted officers who have gone forth from the hallowed walls of West Point to devote their lives to the national defense. The names of many have become symbols of patriotism while others, whose duties did not bring them conspicuously before the public eye, gave their all in unstinted devotion to country. In addition to their unselfish service to the Nation in times of crisis, they have succeeded in other achievements which are just as important, not the least of which has been to inculcate in the Army at large and in the individuals who rub elbows with them, the Spirit of West Point. They are a leavening influence which has wrought mightily in the Army and in public life, by infusing them with their high ideals of manhood. In this day of laxity of obedience to law and morals, in this luxury-loving age, it is a wonderful thing to have an institution like West Point graduating each year and sending out into the world men who are trained in habits of unquestioned obedience to authority—who have an inherent love of the truth and an utter hatred of a lie—whose unfading devotion to *duty* is inherent, whose high regard for *honor* is instructive, and whose loyal service of *country* is the high purpose of their life work.

"God give us men. Times like these demand
Strong minds, great hearts, true faith, and steady hands,
Men whom the lust of office cannot kill,
Men whom the spoils of office cannot buy,
Men who possess opinions and a will,
Men who have honor—men who will not lie,
Men who can stand before a demagogue,
And scorn his treacherous flatteries without blinking,
Tall men—sun-crowned, who live above the fog
In public duty and in private thinking."

Cavalry and Its Training

Maj. Gen. Malin Craig, U.S.A.

SINCE many readers of ARMY ORDNANCE are non-military men it may be appropriate at the beginning of this article to say something concerning Cavalry organization to provide a background for that which is to follow.

The proportion of Cavalry in the United States Army is very much smaller than that of many foreign armies. The latter, as a general rule, have, in addition to their cavalry divisions, many units used as divisional and corps cavalry. In these instances the infantry division has generally one squadron of cavalry as an organic part of the division. Likewise, the foreign army corps generally has a regiment of cavalry as an organic part of the corps. The United States Army organization is somewhat different. We find no cavalry as an organic part of the infantry division or the infantry corps, but certain separate cavalry units, not planned to become a part of a cavalry division, are left available for such assignment in case the situation so demands. In other words, Cavalry forms an organic part of no Division except a Cavalry Division. Our cavalry divisions are Army troops to be assigned missions by the army commander. For these missions we must be prepared, and to be prepared we must undergo certain phases of training.

MAJ. GEN. MALIN CRAIG, U. S. A.
Assistant Chief of Staff, G-3,
Former Chief of Cavalry.

Training Regulations 10-5 set forth, in a broad sense, the lines along which training should be directed. The primary object of training is to prepare troops for combat, or to prepare individuals to become instructors in the preparation of troops for combat. The Training Regulations state, in part:

"*a.* The Cavalry weapons in order of their importance are the rifle, the pistol, and the sabre. Its other weapons are auxiliary. Mobility, firepower, and shock are the essential characteristics of the branch.

"*b.* This branch will be trained in:

(1) Ability to march and maneuver in bodies of all sizes with ease, speed, and flexibility, and to so conserve the powers of endurance of horse and man over long distances as to be constantly capable of further effort.

(2) The development of fire power in suitable tactical formations to the utmost degree consistent with no serious impairment of mobility.

(3) Attainment of standard skill in the use of all weapons with which equipped.

(4) Combined dismounted and mounted action; dismounted action; mounted action, particularly for the smaller units.

(5) Strategical reconnaissance in cooperation with the Air Service; tactical reconnaissance, including scouting and patrolling; screening; seizing and holding important positions; pursuit and exploitation; delaying actions and covering a withdrawal; attack of hostile cavalry; detached action against key points of enemy supply and communication system or other justifiable objectives.

(6) Hasty demolition; construction of shelter and obstacles."

Going on, the regulations state that each individual must be developed to the greatest possible extent, physically and mentally, and acquire the greatest possible proficiency in the specifications of his grade; that he be instantly responsive to the demands of constituted authority and that he learn how to function in his team. Similar characteristics must be developed in each organization. Hence, we see that training pertains not only to organizations, but also to each individual of an organization. Therefore it can be seen that a great deal could be written about the training of an organization, the training of officers, the training of non-commissioned officers, the training of privates, or the training of specialists.

(Underwood and Underwood)

MAJ. GEN. HERBERT B. CROSBY, U. S. A.
Chief of Cavalry.

Our Service Schools constitute one of the principal agencies of peace-time training. Before training of any nature is entered upon there must be discipline. This is defined as "an attitude characterized by willing and cheerful obedience to orders, by a scrupulous conformity to standardized procedure, and by unremitting effort in the appropriate sphere of initiative, evidenced in part by smartness of appearance and action, by cleanliness of person and neatness of dress, and by respect for superiors." The elementary training of a soldier makes for discipline. Herein we find our value for drill ground exercises. This is the beginning; from then on training should be progressive. It is carried on, generally speaking, under the supervision of corps area commanders and chiefs of branches. Training programs and standards of proficiency set forth the objectives to be attained. Interest is stimulated in various manners, but principally through competition.

Every instructor should be a master of his subjects; every leader should be well instructed. The large percentage of instructors are officers. The means provided for their development in time of peace are service schools, the correspondence courses, and duty with troops. Reserve and National Guard officers have all these facilities available for them.

At the Cavalry School at Fort Riley, Kansas, there is annually conducted a course for field officers, known as the Advanced Course, a course for troop officers, known as the Troop Officers' Course, and other courses for Reserve and National Guard officers. In addition, there are courses for enlisted men. Certain enlisted personnel of Cavalry must have schooling in such subjects as horseshoeing, saddlery, cooking, baking, communication, demolition, etc.

Although we have learned many lessons from the employment of more than one hundred divisions of Cavalry during the World War, the lessons of the war have affected very little the American idea of Cavalry training. New inventions such as armored cars, airplanes, etc., have enhanced the value of Cavalry and added to its power and scope. These inventions bring the r e l a t i o n s h i p between Cavalry and Ordnance much closer together.

The training of Cavalry may, for convenience, be divided into three classes—namely, basic, technical, and tactical training. The first class applies to all personnel; the second to certain specialists; the third particulalry to officers. Competition is always an important element in any class of training. It is a psychological fact that a favorable attitude is conducive to rapid learning. Since time immemorial the life of man has been one of struggle for survival against men, animals and the elements. The competitive spirit is inherent in the human race. In those subjects in which one man feels that he can excel his fellow-man he will take more interest. He will learn more easily and with less fatigue. In order to take advantage of these psychological facts the instructor must arrange methods whereby the learning of one man is matched against the learning of another.

War Department regulations and training regulations have created standards in many subjects. These are commonly called "standards of proficiency." They increase the attention and establish the work of the man; however they are not sufficient to bring forth the greatest effort. What men want is an opportunity to excel. Work should be made as far as possible a game. In this respect the Cavalry has one great advantage over other arms. It is because the element of the horse is introduced. In order to be a good cavalryman one must be a good horseman. Competition in horsemanship increases the individual skill. Hence horse shows and other forms of mounted competition are not only play for the cavalryman, but are of great value in his training.

Most of the training of cavalry is mounted training. We have training in the use of the pistol, mounted; training in the use of the sabre, mounted; training in scouting and patrolling, security, and information, mounted; disciplinary training in mounted drill.

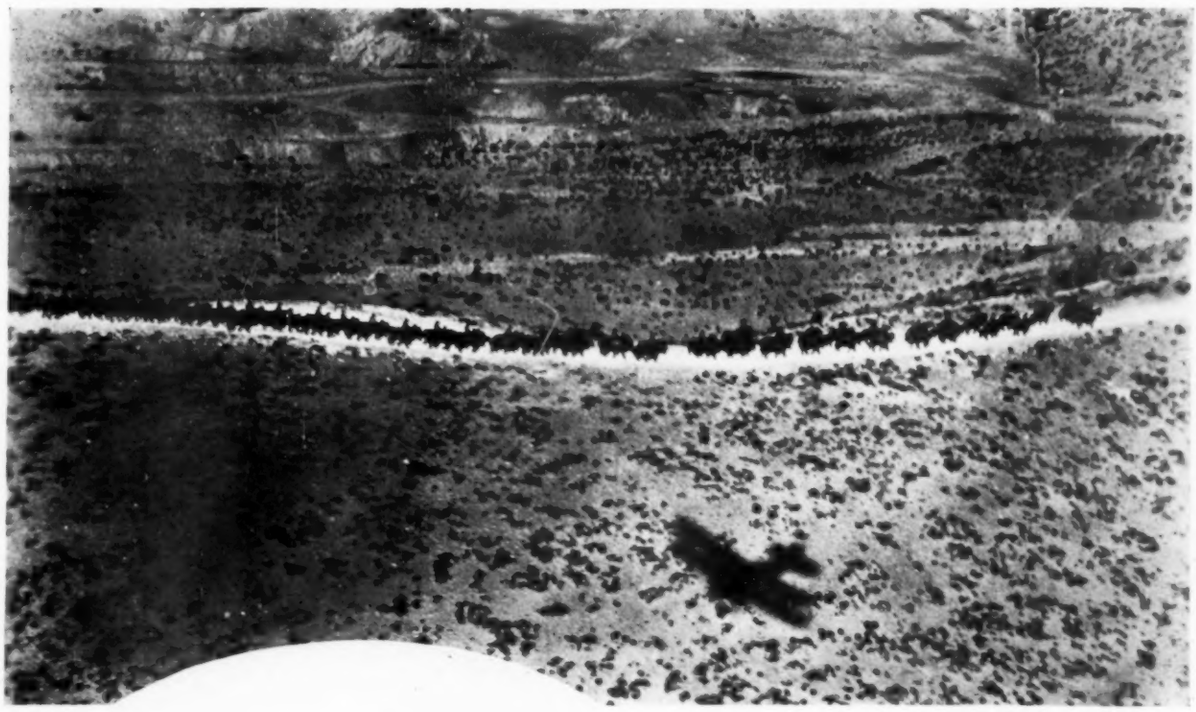
The heroic traditions of the horse in warfare extend back to the earliest conquests of the Medes and Persians. In modern warfare he plays an equally important role: during the World War splendidly successful cavalry charges were made against artillery, infantry and even against troops in the trenches.

Here are shown some of the training activities of rider and mount which have brought American Cavalry to its present high state of efficiency.

Above: Cavalry troops reconoitre over the hilly slopes of the American Southwest.

Oval: True and tried, the Army mule is still the trustiest pack carrier where trucks and motorized artillery cannot negotiate.

Below: Field Artillery Component of a Cavalry Division at practice with 75-mm. Guns.



Above: Across the desert wastes the troops of the First Cavalry Division, El Paso, Texas, are shown on a practice march.

Oval: Encamped for the night tired men and animals of the First Cavalry Division after a strenuous day of maneuvers.

Below: On the march—Troops of the First Cavalry Division keep in efficient condition on the sandy, cactus-strewn plains of Texas.

In what has gone before we have spoken of cavalry training with more or less reference to detail. Special emphasis has been directed toward basic training. In view of the fact that this is the ground work where discipline is gained, it is one of the most important phases of training. Before the instructor can hope to gain discipline from his men he himself must be disciplined. He must also have knowledge of his subject. These are two essential requisites for an instructor. After one is such an instructor, and has the men to train, and knows the objectives to be obtained, the training can go on in a progressive manner. But this is not the end. The final phase of training is the inspection. It is an important element of training. The primary purpose of inspection is not merely to see if training is making progress and getting results. It enables the commander to see to it that he and his units are making progress and getting results. It serves many other purposes of great importance. It constitutes the most effective means of insuring that individuals and units do, in fact, reach the prescribed proficiency standards in all phases of training. It is instructive—and therefore is *training*—for the inspector and the inspected. It promotes competition. It permits the commander to determine the effectiveness of different methods of training. It informs him of the training abilities of his instructors.

A cavalryman at practice with the automatic pistol.

Having attained the desired objectives in basic training, having instilled in the individual the idea of discipline and loyalty, and having aroused the desire of individuals to excel in various forms of competition, the grounding of the soldier is achieved and we pass to the technical and tactical training. Here our various Service Schools begin to play their part. Specialists are educated along the lines they are most qualified to pursue. The instruction is progressive. In the officers' schools one passes from the squadron to the regiment, then to the brigade and the division. Cooperation between Cavalry and other arms (team play) is emphasized. The officer through handling "paper organizations" learns to visualize the many units of the division. He sees them marching in one column, or on parallel roads, and forms a mental picture of the enormous mobility of cavalry—the amount of territory it can traverse. He sees the airplanes assisting him in reconnaissance. He is beginning to understand that it takes a team of different arms instead of a "one-man team" to win large battles.

Relief after a long march.

Field Artillery of the Cavalry Division.

Training is like a circle, it has no end. New men come as older men go. Basic, technical and tactical training are, therefore, constantly going on. The progression is never ended. The desire is that when war does come the Cavalry will be prepared to meet the emergency. All training is based on methods which best carry out this principle.

New York State National Guard Reservation, Peekskill, N. Y.

National Guard Training Camps

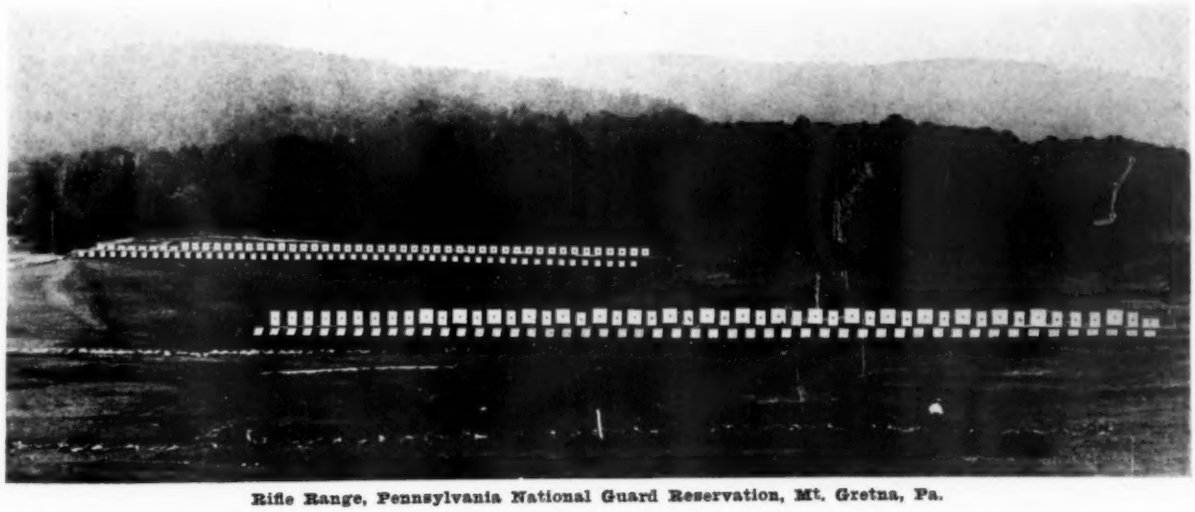
Maj. Gen. Creed C. Hammond, U. S. A.
Chief, Militia Bureau, War Department

TRAINING camps are authorized and required for the field training of the National Guard in time of peace and are the final phase of the yearly cycle of prescribed training. This is a concise statement of fact and in back of it are many ramifications involving the law, regulations and detailed arrangements for training the large number of men involved.

Let us first briefly consider the provisions of law which make possible the training camps for our National Guard. The basic authorization for this training is contained in the National Defense Act of 1920, Section 94, which provides, "Under such regulations as the President may prescribed the Secretary of War is authorized to provide for the participation of the whole or any part of the National Guard in encampments, maneuvers, or other exercises, including outdoor target practice, for field or coast-defense instructions, either independently or in conjunction with any part of the Regular Army, and there may be set aside from the funds appropriated for that purpose and allotted to any State, Territory, or the District of Columbia, such portion of said funds as may be necessary for the payment, subsistence, transportation, and other proper expenses of such portion of the National Guard of such State, Territory, or the District of Columbia as shall participate in such encampments, maneuvers, or other exercises, including outdoor target practice, for field and coast-defense instruction; and the officers and enlisted men of such National Guard while so engaged shall be entitled to the same pay, subsistence, and transportation as officers and enlisted men of corresponding grades of the Regular Army are or hereafter may be entitled by law."

Of course there have been many amendments to the Act relative to National Guard training. These include provisions for additional pay of National Guardsmen who participate in aerial flights; pay adjustments for officers and enlisted men; medical and hospital treatment at Government expense for injuries incurred in the line of duty, and so on. There are also provisions of the organic law relating to the detail of officers of the Regular Army to act as instructors at National Guard camps, to the conduct of such camps when they are held on military posts or reservations where officers and troops of the Regular forces are also stationed or in training.

But the law on the subject is rather a prosaic recital; I will not bother you with more of its details. Likewise the regulations which carry these provisions of law into effect are too many and too voluminous for detailed dis-



Rifle Range, Pennsylvania National Guard Reservation, Mt. Gretna, Pa.

cussion in an article such as this. Both the law and the regulations are readily accessible to any who desire to go into the subject more deeply. The point I am endeavoring to make in this preliminary discussion is that we have in the law and the regulations, the foundation for the annual encampment and training of our National Guard. My main endeavor here is to visualize for the reader the several elements which go to make the National Guard a complete component of the Army of the United States.

The distribution of the National Guard on February 28, 1926, is shown in the accompanying table.

Strength of the National Guard, February 28, 1926

State	Strength	No. of Stations	No. of Headquarters	No. of Units
1st Corps Area	19,451	133	79	327
Connecticut	4,219	25	18	68
Maine	1,949	27	9	35
Massachusetts	9,894	48	40	163
New Hampshire	987	12	4	18
Rhode Island	1,341	5	4	23
Vermont	1,061	16	4	20
2nd Corps Area	26,650	83	108	441
Delaware	755	6	3	14
New Jersey	4,466	27	20	76
New York	21,429	50	85	351
3rd Corps Area	19,414	133	84	326
Dist. of Col.	811	1	5	12
Maryland	2,988	21	13	51
Pennsylvania	11,561	79	51	203
Virginia	4,054	32	15	61
4th Corps Area	19,225	206	78	326
Alabama	2,490	31	9	47
Florida	2,094	24	9	39
Georgia	3,541	23	14	59
Louisiana	1,877	20	9	31
Mississippi	1,454	25	7	26
North Carolina	3,126	44	15	53
South Carolina	2,099	22	6	32
Tennessee	2,544	17	9	39
5th Corps Area	16,671	161	75	290
Indiana	4,727	49	22	82
Kentucky	2,687	30	12	49
Ohio	8,128	71	37	141
West Virginia	1,129	11	4	18
6th Corps Area	17,793	117	76	302
Illinois	8,793	31	36	147
Michigan	4,149	27	18	77
Wisconsin	4,851	59	22	78
7th Corps Area	22,036	240	91	374
Arkansas	2,195	27	7	37
Iowa	3,393	37	16	59
Kansas	3,198	31	15	51
Minnesota	4,444	45	19	81
Missouri	4,460	47	18	74
Nebraska	1,786	19	6	32
North Dakota	1,277	18	4	20
South Dakota	1,283	16	6	20
8th Corps Area	16,934	182	73	287
Arizona	820	6	3	14
Colorado	1,731	19	6	33
New Mexico	994	12	5	16
Oklahoma	5,392	55	24	89
Texas	7,997	90	35	135
9th Corps Area	13,871	118	55	227
California	4,724	26	22	81
Idaho	854	11	3	16
Montana	1,112	18	4	20
Nevada	No National Guard.			
Oregon	3,020	26	10	41
Utah	951	9	4	16
Washington	2,532	17	9	41
Wyoming	678	11	3	12
Territories	3,200	27	9	52
Hawaii	1,447	11	4	25
Porto Rico	1,753	16	5	27
Aggregate	175,245	1,400	728	2,953

It is probable, based upon figures compiled from previous Field Training Reports, that 85 per cent of the total strength of the National Guard will attend camp during the coming summer. For the training season of 1925 a total of 152,970 officers and men attended camp out of a total strength, on June 30th, of 177,525.

These 152,970 National Guardsmen attended one or another of a total of 86 Training Camps, some of which were open for but fifteen days, the prescribed period, while others, such as Camp Smith, Peekskill, N. Y., were open from the middle of June until the end of September.

Of the 86 Training Camps, 51 were exclusively for National Guardsmen, i. e., only troops of that component of the Army of the United States participated in the training thereat. The remainder, or 31, were what are termed Concurrent Training Camps, or camps at which troops from other components of the Army were in training or where there were R. O. T. C. or C. M. T. C. activities. At the National Guard camps 92,624 officers and men participated, while at the Concurrent Camps 60,346 took part.

It is the policy of the Militia Bureau of the War Department to encourage the establishment of at least one camp in each state or territory, under State control, either owned, leased, or held on revocable license by the State, sufficient in area to provide a camp for all the National Guard troops of that State, with the exception of Field and Coast Artillery units in those states where suitable areas for target practice for Field Artillery and suitable armaments for Coast Artillery units are not practicable or available.

In general the states are required to provide the land and roads and the Federal Government provides the essential camp utilities, subject to certain conditions as to length of time available for military use, and subject to the right of the Federal Government to salvage any utilities constructed with Federal funds when the land ceases to be used for military purposes.

In general, it is the policy to provide for each camp, at Federal expense, only the barest essentials for the

500-yard Target Pit, Mt. Gretna, Pa.

health and comfort of the troops and the economical administration of the camps, leaving the cost of providing roads (except for Federally controlled camps), the elaboration of the types of buildings, and any other additional refinements, to be borne by the states.

The essential camp utilities that are provided at Federal expense, in order of priority, are as follows: Maintenance and repairs of water, sewer and electric light systems; existing structures, and roads on Federally owned camps. Permanent construction of new roads is prohibited by recent Act of Congress.

Target Range, California National Guard, Leona Heights, Cal.

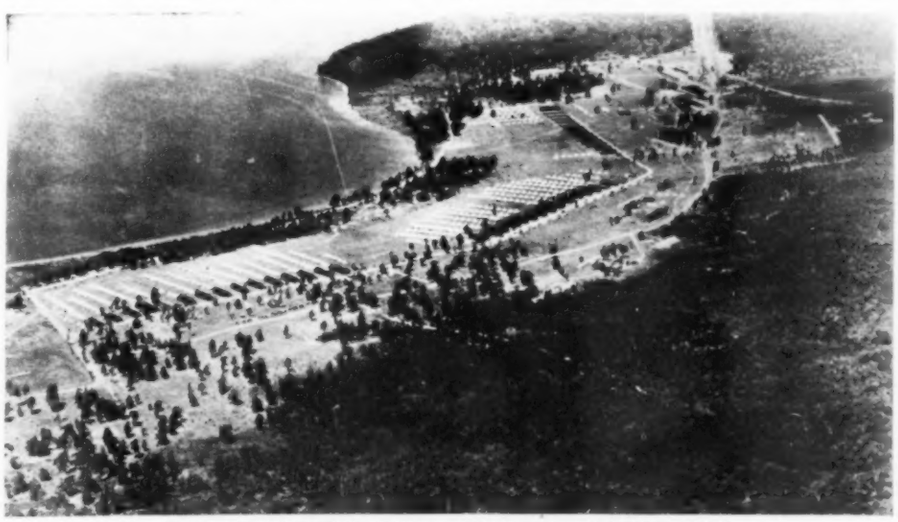
At cantonments where buildings are available it is desirable to make use of such available facilities rather than to install a tent camp, so long as such camps are less than would be the cost of a tent camp. As buildings or utilities deteriorate the camp will be changed to a tent camp.

In locating a tent camp to replace existing buildings in cantonments the site is carefully chosen so that it will be permanent and so that the maximum use will be obtained from funds expended. Where a part of a cantonment is used, such part is selected so that the change from the cantonment accommodations to tent camp accommodations can be made gradually, and the tent camp finally supersede the cantonment accommodations without losing the money expended from year to year on installations and utilities.

Wherever other troops than the National Guard are to be provided for on the same reservation the lay-out of the camp is such as to make the cost of the combined installation for all a minimum, and so that a portion of the cost of the basic installations can be borne by appropriations for each class of trainees. Inasmuch as these camps are continuing activities great thought is given to their location and plan so that the improvement made each year is not wasted, but may be added to from year to year until the project is completed.

Buildings on Government or state owned land or on land held under long term lease and where camps have been agreed upon as permanent, should be of such substantial construction that the savings in repairs and maintenance would justify the original cost above the cost of temporary structures. In general, buildings should be of standard design prepared by the Quartermaster General in consultation with the Chief, Militia Bureau, and approved by the Secretary of War. Special authority can be granted for minor variations in standard design in exceptional cases where necessary to conform to local conditions; factors involved are climate, existing structures, and funds available. At camps whose permanency has not been established or on grounds where the lease is for five years or less, the construction should be of temporary and inexpensive type—limited to bare necessities of water supply, pit latrines and shower baths without roofs.

It can readily be seen from what has gone before that the training camp activity, from the Federal, as well as the State point of view, is a big one. After vast sums of money have been expended and elaborate preparations made for this one phase of training there is a most wonderful opportunity for the personnel, both Regular and National Guard, to accomplish much. The Regular sol-



Camp Grayling State Military Reservaton, Grayling, Mich.

dier, be he officer, non-commissioned officer or enlisted man, is given the opportunity to impart his knowledge, whether it be technical or practical, to the National Guardsman; the National Guardsman to absorb all that this contact with professional soldiers can produce. There can be no doubt but that all will benefit much from this cooperation.

From an Ordnance view-point this may seem to be slightly more difficult than for most other branches of the service—and it is admitted as a fact—but there is a good opportunity for personnel of the Ordnance Department to impart technical instruction to troops of the National Guard during the field training period. Some of this Ordnance personnel will be detailed as instructors, others will be caring for the Ordnance requirements of the troops, and others will be enjoying concurrent training at the same camp, but all can, and should, avail themselves of this privilege.

Two striking incidents of the manner in which this may be done are related in order that I may make my point.

The first is the story of the Ordnance Officer at a camp where concurrent training was going on who hit upon the scheme of having National Guard Supply officers bring to him for inspection any and all Ordnance matériel which they thought was unserviceable. This matériel was inspected and if found to be as represented, was accepted by the Ordnance officer and replaced by like property from his supply. This transaction was made of definite record in order that no misunderstandings could occur. This left the National Guard Supply Officer free to proceed with the necessary reports of survey, and so forth, in order to be properly relieved from the responsibility for the unserviceable property, and at the same time to take up the responsibility for the new and serviceable property which he then had on hand. The good resulting from such an activity is of incalculable value, as it not only effected a savings to the Federal Government in transportation and expenses of personnel by obviating visits to the home stations of units which had this unserviceable matériel on hand and of freight transportation on many small shipments from many stations to an Ordnance Depot, but, in addition, it placed in the hands of the National Guard serviceable Ordnance matériel, which, in the last analysis, is the primary function of the Ordnance Department.

The other story is of a Captain of Ordnance who was assigned as are instructors for the National Guard of an entire Corps Area. This is a task in itself, but when it is complicated by shortage in travel funds, it made it practically impossible for this officer to see some of the troops of his Corps Area more than once during the year and that, for but a day or so at the most, at the Training Camp. This officer felt that there must be many unserviceable rifles throughout the National Guard of his Corps Area but not having the opportunity to look over and gage each rifle individually, it was impossible to get them surveyed and turned into an Ordnance Depot in order that replacements could be made. This being another case of a man who desired to do, he evolved the scheme of getting the National Guard Camp Commander to assemble all the officers and mechanics of their troops for a talk of about one hour on the subject, "How to look for unserviceable rifles and the use of the gage." Upon assembly this Captain would tell them why it was impossible for him to look over each rifle personally, why it was necessary that they should be examined carefully, and "why" the use of the gage in detecting unserviceable barrels. He explained how any officer, if he thought that he had any unserviceable Ordnance matériel, could write to him direct, stating the facts in the case, and he would advise him. If it was a case where a gage was necessary, one would be forwarded to him for use and return. This would give the National Guard officer something to base a report of survey on, and in the end give him serviceable matériel. The story goes on that he sold his proposition and sold it well, for during the next year six gages were constantly on the go and a large number of unserviceable rifles and other matériel were surveyed and replaced.

Now let me say a final word to all interested in Ordnance. Don't feel that it is a game of give all and take nothing. Remember that the National Guardsman is not a professional soldier—remember that he is a patriotic chap who believes in preparedness, first, last and all the time—remember that his round-the-year soldiering has to be practiced after store, shop or office hours—remember he has to earn his living and provide support for his family before he can even start those things which are routine to the professional soldier—remember that he faces the daily battles of business, once every twenty-four hours and—remember, last, but not least, that he is, pretty generally, a respected member of the community in which he lives. When you recall all of these things I feel sure that you will go to him with a ready and willing helping hand, but at the same time go in a receptive mood, for this National Guard chap knows many professional and business short cuts which will be of vast assistance to you in your everyday life.

It is a big gap from the laws which authorize and require training camps for the National Guard to those whose prime interest is Ordnance—giving help to, and receiving help from, a member of the Militia, but not too big for all of us to bridge. And the building of this bridge is final proof that "In Unity There Is Strength."

The War Department Business Council

Hon. Hanford MacNider
Assistant Secretary of War

THE Secretary of War is concerned with the major problems of the National Defense. His Chief of Staff on one hand directs and plans for the military establishment. On the other the Office of the Assistant Secretary of War conducts the business of the peace-time establishment and plans for its supply in time of emergency.

The Office of the Assistant Secretary is charged with the current procurement of the Army. It is a plain, every-day business problem, circumscribed, however, by many laws and necessary regulations. It is its duty to evolve policies for the guidance of the various services of supply and supervise their enactment. That is, it makes no actual purchases but is responsible for the manner in which they are made.

In brief, the Assistant Secretary of War is charged with responsibility for a business-like administration of the military establishment. It is his job to make every dollar appropriated for defense do its full duty.

It is particularly important that our current supply set-up be on the most efficient basis, because it must form the foundation for any emergency effort. Under the National Defense Act we are charged with "assurance of adequate provision for the mobilization of matériel and industrial organization essential to war-time needs."

This foundation must not only be sound but it must be strong and broad enough to support a structure a hundred times its present size without crumbling under the strain. It must be capable of bearing a heavier load at every point, a pyramiding of untold ramifications.

A great framework for industrial mobilization in emergency is being developed. Many are taking an active part part in our endeavors along the lines of industrial preparedness. One can realize how important it is that there be no question about the integrity of our basic system.

With this thought in mind, some of the recognized leaders of American industry were asked to serve on a War Department Business Council. In this way the War Department has enlisted the help of these gentlemen as outstanding leaders and experts in that part of the business world most closely allied with our current supply problems. We have asked them to give of their valuable time, to leave important posts at considerable sacrifice to their associates and themselves that we might be aided by their counsel.

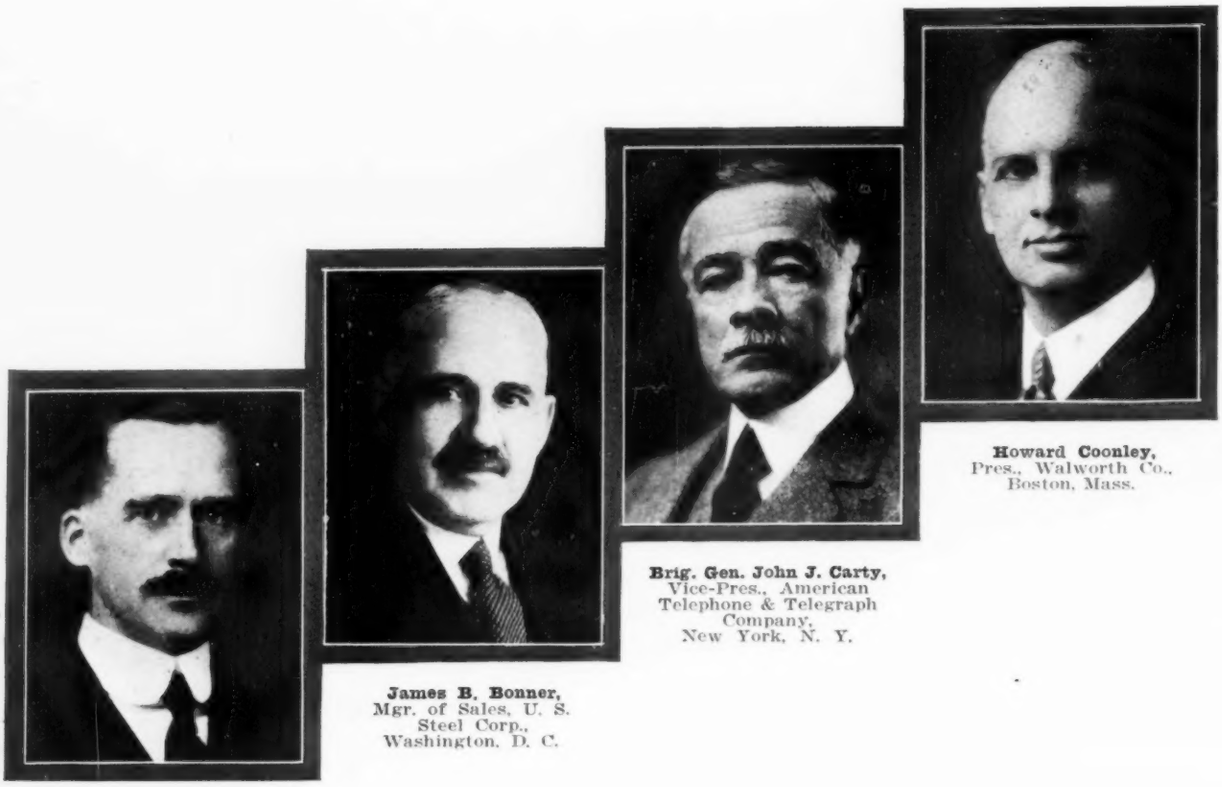
At the first meeting of the War Department Business Council, held in Washington, March 13, 1926, the following civilian members responded to our call: Col. Leonard P. Ayres, Vice-President, Cleveland Trust Company, Cleveland, Ohio; Mr. James D. Bonner, Manager of Sales, United States Steel Corporation, Washington, D. C.; Brig. Gen. John J. Carty, Vice-President, American Telephone and Telegraph Company, New York City; Lieut. Col. F. S. Dickinson, President, Becton, Dickinson & Co., surgical instrument manufacturers, Rutherford, N. J.; Mr. George B. Dryden, President, Dryden Rubber Company, Chicago, Ill.; Lieut. Col. Oscar W. Smith, President, Park, Davis & Co.; Col. Wm. C. Spruance, Vice-President, E. I. duPont de Nemours & Co., Wilmington, Del.; Col. Wm. A. Starrett, Vice President, Starrett Brothers, contractors, New York City; Brig. Gen. S. Herbert Wolfe, consulting actuary, New York City. I had the pleasure of addressing these gentlemen at this meeting and I took that occasion to thank them most sincerely for their valued cooperation.

The meeting was also addressed by Col. E. D. Peek, in charge of Current Procurement in the Office of the Assistant Secretary, and by the several chiefs of Branches of the War Department, each of whom outlined the particular problem of his Branch. Among those who addressed the meeting were: Maj. Gen. B. F. Cheatham, Quartermaster General; Maj. Gen. M. W. Ireland, Surgeon General; Maj. Gen. K. W. Walker, Chief of Finance; Brig. Gen. Edgar Jadwin, Assistant Chief of Engineers; Maj. Gen. C. C. Williams, Chief of Ordnance; Maj. Gen. C. McK. Saltzman, Chief Signal Officer; Maj. Gen. A. A. Fries, Chief, Chemical Warfare Service; Maj. Gen. M. M. Patrick, Chief of Air Service.

These addresses were followed by an organization meeting, at which subcommittees were appointed to study the problems of the several Branches as indicated below: Col. Leonard P. Ayres and Col. Wm. A. Starrett, Office of the Quartermaster General; Lieut. Col. O. W. Smith and Lieut. Col. F. S. Dickinson, Office of the Surgeon General; Brig. Gen. S. H. Wolfe, Office of the Chief of Finance; Col. W. C. Spruance and Mr. James B. Bonner, Office of the Chief of Ordnance; Brig. Gen. J. J. Carty and Brig. Gen. C. G. Edgar, Office of the Chief Signal Officer; G. B. Dryden, and Howard Coonley, Office of the Chief, Chemical Warfare Service; Ralph Van Vechten, Office of the Assistant Secretary of War; Col. S. M. Felton, Office of the Chief of Engineers; Gerard Swope and C. W. Nash, Office of the Chief of Air Service.

These subcommittees will be called together again for further discussion after they have had an opportunity to study the problems of the Branches to which assigned.

I believe that we can regard the formation of the War Department Business Council as an important step in our plans for adequate preparedness. I feel that the War Department and the country at large are to be congratulated on having made available the expert advice and cooperation of the gentlemen who compose the Council, and I have no hesitancy in saying that their work will be one of the most far-reaching factors in our general preparedness plan. I look upon it as another instance of introducing modern business method and business efficiency into the operation of the Government, with the prospect of saving our nation countless lives and untold sums of money should another emergency unhappily come, because it is by perfection of our organization and development of our procurement plans that we can hope to control that most important factor—time—which enters into every procurement problem in peace or war.



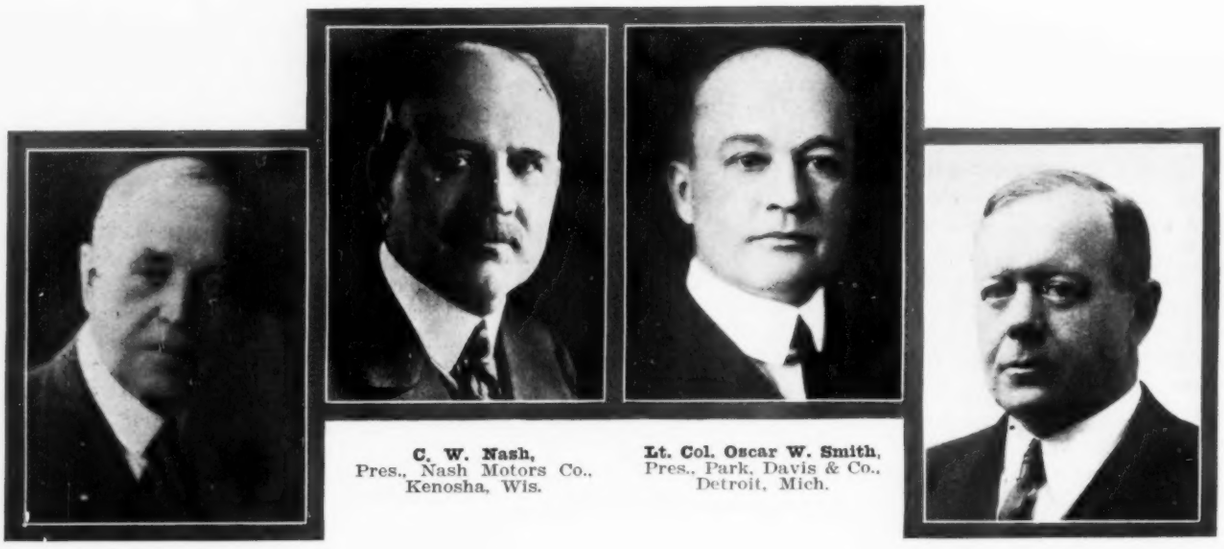
Howard Coonley,
Pres., Walworth Co.,
Boston, Mass.

Brig. Gen. John J. Carty,
Vice-Pres., American
Telephone & Telegraph
Company,
New York, N. Y.

James B. Bonner,
Mgr. of Sales, U. S.
Steel Corp.,
Washington, D. C.

Col. Leonard P. Ayres,
Vice-Pres., Cleveland
Trust Co.,
Cleveland, O.

WAR DEPARTMENT



C. W. Nash,
Pres., Nash Motors Co.,
Kenosha, Wis.

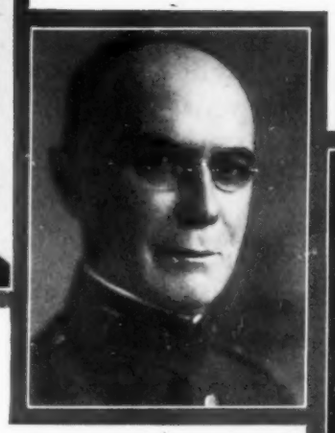
Lt. Col. Oscar W. Smith,
Pres., Park, Davis & Co.,
Detroit, Mich.

Col. S. M. Felton,
Chairman,
Chicago-Great Western Railroad Co.
Chicago, Ill.

Col. Wm. C. Spruance,
Vice-Pres., E. I. duPont
de Nemours & Co.,
Wilmington, Del.

The principal purpose of the Army Business Council is to consider the necessity of maintaining a procurement system in time of peace that will be most effective in war. In so doing the Council will determine whether the Assistant Secretary of War has such an organization, procedure, and control as will insure efficient supervision of procurement and a proper utilization of the consolidated buying power

Hon. Hanford MacNider,
Assistant Secretary of War,
Washington, D. C.



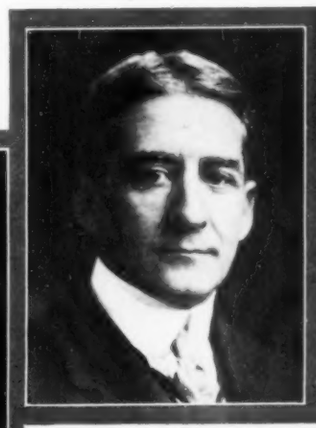
Lt. Col. F. S. Dickinson,
Pres., Becton, Dickinson & Co.,
Rutherford, N. J.

George B. Dryden,
Pres., Dryden Rubber Co.,
Chicago, Ill.

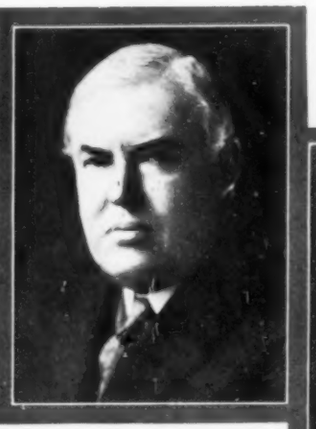
Brig. Gen. Clinton G. Edgar,
Pres., Continental Sugar Co.,
Detroit, Mich.

BUSINESS COUNCIL

Col. William A. Starrett,
Vice-Pres.,
Starrett Brothers,
New York, N. Y.



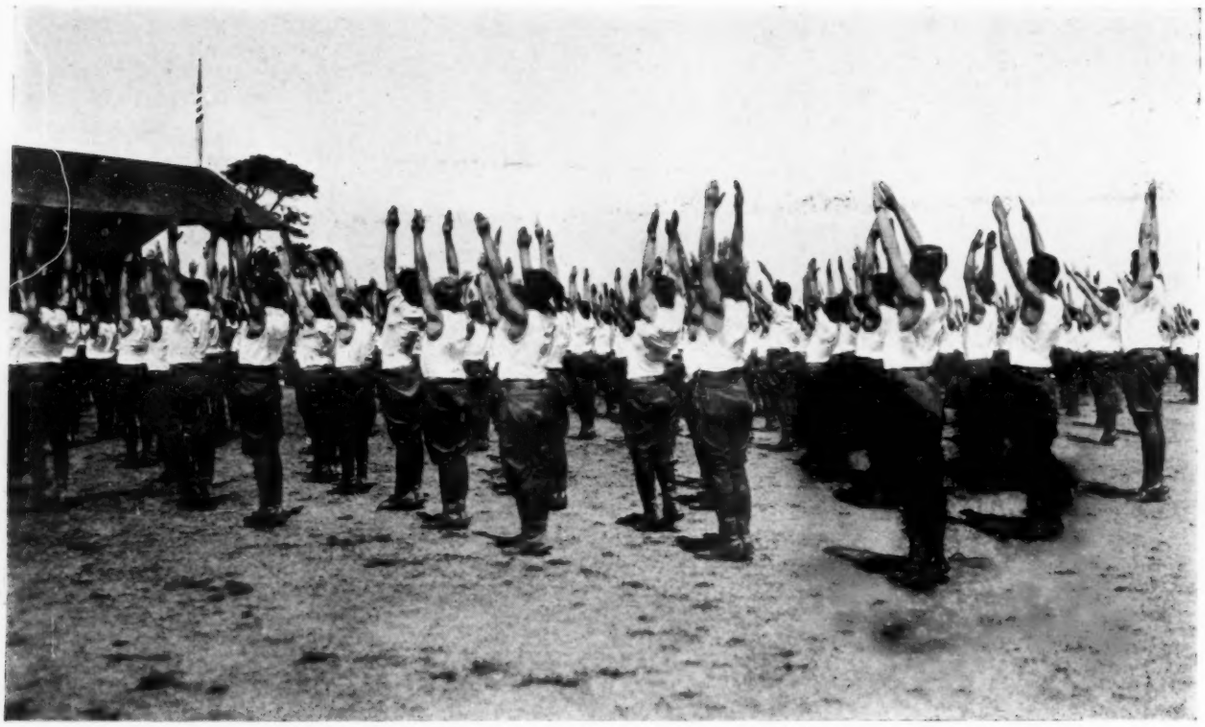
Gerard Swope,
Pres.,
General Electric Co.,
New York, N. Y.



Ralph Van Vechten,
Vice-Pres., Continental Commercial Bank,
Chicago, Ill.

Brig. Gen. S. Herbert Wolfe,
Consulting Actuary,
New York, N. Y.

of the Army. The Council will also determine whether the various Supply Branches of the Army are properly organized for efficient procurement by the purchasing agents thereof, adequate supervision of procurement by the several Chiefs of Branch, and proper utilization of the consolidated buying power of the Branch. The Council will make recommendations for the correction of any defects found.



Healthy Minds in Healthy Bodies—Calesthenics at Del Monte, California, C. M. T. C., 1925.

Citizens' Military Training Camps

Maj. Gen. C. P. Summerall, U. S. A.

AT THIS time when extremists of various shades are advocating the relinquishment of our military program and calling attention to fancied dangers of militarism, or to imaginary extravagancies in the upkeep of the Army, it is important to consider what the Army is doing for the mental, moral and physical fitness of our people.

The World War shattered the illusion that national defense was sufficiently secured by the maintenance of a small navy and a diminutive army, a disillusion that was so costly in men and money, and brought us to the realization that national defense in the larger sense depends upon the whole people, and that modern wars are waged by nations in their entirety. As a result of this lesson, the National Defense Act of 1920 was written, which in a specific way charges the War Department with the preparation of the defense of our country within the limits of sums appropriated by Congress. Charged with the responsibility of national defense in a greater measure than ever before in its history, the Army is endeavoring to effect practical solutions for the national weaknesses revealed by a study of national defense problems. We realize that we are charged not only with securing victory if war comes, but also with preparing our citizens during peace, so that in time of war, they shall not lose their lives unnecessarily. As practical Americans, we have tried to profit by the lesson that has cost us vast human suffering and an appalling public debt.

General Summerall Inspects Camp.

In the National Defense Act is stated the best, most conservative American thought on the subject of preparation for defense—arrived at after a long and searching canvass of the opinions of those of our citizens who were placed in positions to know what we need.

It is devised to give us absolute security against the dangers of war, to avoid any semblance of militarism or the formation of a military class, and to accord with our strong desires for economy. In this Act we provide for the smallest Regular Army which will guarantee our immediate protection and the defense of our foreign possessions. We provide for a National Guard to give the states a control over

our emergency forces. Finally, we provide for an Organized Reserve and for a system of training our citizens so that they can enter the Reserves and be somewhat prepared for their emergency tasks. The Regular Army and the National Guard constitute our police force. The Organized Reserves constitute the material from which we can organize a national posse to support the police during periods of international outlawry.

The real administration of justice in a community depends upon the effective cooperation of the citizens even more than upon the police force which represents them. Many desperadoes would brave the dangers of police action if it were not, that they know that good American citizens would support the police. In a national sense, it is similarly the Organized Reserves who are the real strength of our defenses. Our citizens have the spirit for such service. The only limitation to their ability to act in the national posse is their training. Their long rifles no longer accompany them in peace as they did in former years. Many of them have become softened by life in the cities. In order to continue the strength of our society as it has been in the past, we must find some means of insuring that our citizens will keep up their physical standards and continue their ability to defend their homes and families. Americans are to have the opportunity to learn the things that their ancestors learned by combatting the forces of nature. Individual citizens are to have the training in defense that is the guarantee of a free people like ours.

"Heigho, All Together"—C. M. T. C. Boys in Annual Tug-of-War at Plattsburg.

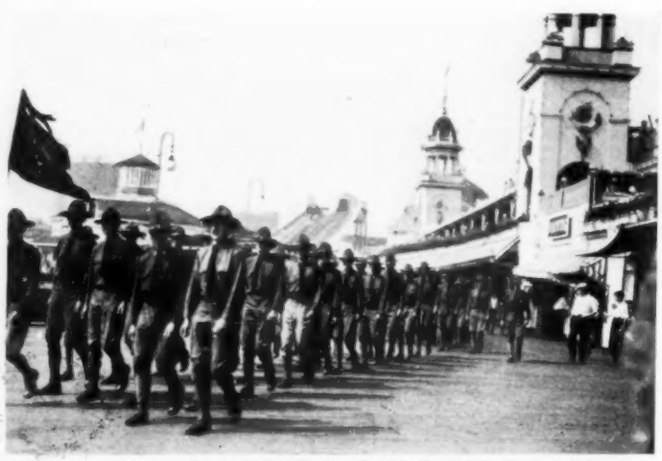
For this purpose, we have established the Organized Reserves, the R. O. T. C., and the Citizens' Military Training Camps.

In our immediate history, the Citizens' Military Training Camps had their beginning in the "Plattsburg idea." The principle of their development is however very much older. This principle is one that has always been followed by peace-loving self-governing peoples who have had success in maintaining independence. It is the same principle that leads the Swiss to train every young man for defense, and yet keeps them neutral during the most turbulent conflicts among nearby nations. It is the principle that led our early settlers to learn to shoot and to ride and to excel in outdoor games. It is an outward expression of an independent spirit. There need be absolutely no fear of militaristic tendencies growing from this activity of a free citizenship. We employ professional instructors to conduct these camps, just as our ancestors learned to shoot from the teachings of hunters and scouts. On the other hand, we insure that the summer camps will be open to the public, to our representatives in Congress, to the families of the young participants themselves. The influence will be towards Americanizing our permanent military forces, rather than towards militarizing our young men. The latter will come from these camps improved in body and soul, better able to appreciate the rights and responsibilities of citizenship and fully able to defend country and flag.

C. M. T. C. Boys Starting Off to View Au Sable, near Plattsburg, N. Y.

A few superficial opponents of this training program pretend to see in it a repetition of the means whereby certain autocratic governments have molded their people into a well drilled mass, suited to be ground through the mills of a vast military machine. Nothing could be farther from the truth. They are not taught to look forward to a coming day of war. They are not encouraged to look up to an officer class, or to any imaginary ruling class. On the contrary, they are taught to respect their own rights

fiercely and to determine to make them eternal. They are taught team-work rather than blind obedience. They are shown how a free people must organize themselves for defense if the need should arise. They are encouraged to attend religious services, to learn to adjust their own hopes and aspirations to suit the common ideals of Americanism, and to develop their bodies, so that physically, mentally, and spiritually they will be better fitted to contribute their future share to the advancement of mankind.



C. M. T. C. Boys from Fort Hancock, N. J., Visit Coney Island.

Instructions by the Secretary of War insure the desired character for their courses. The day is divided into periods approximately as follows: Physical development, one hour; citizenship studies, one quarter of an hour; elementary hygiene and sanitation, one quarter of an hour; drill, one and a half hours; and rifle practice, two hours.

Approximately five hours each day are thus given to formal instruction. The remainder of the day is then available for athletics and recreation. At the beginning of camp the young men are ready for rest when their five hours are completed. As they harden their muscles, they become more able to employ the remaining hours in sports and they are given every opportunity to do so.

Because of limitations in appropriations, only 35,000 can attend camps throughout the country. We want these young men to come from all occupations and walks of life. Thus far three-fourths of them have been from the schools and colleges and one-fourth from the industries. Public-spirited employers are granting their young men summer vacations at full pay, as a reward for good work in these camps.

They know that the young men will return after a month at camp to an improved service, due to their gain in health, physical stamina, and spirit of teamwork. It should be the spirit of the American people, to devote funds necessary to the summer training of an increasing number of young men, knowing that the ultimate effect will be an increase in national prosperity.

I believe that the finest thing about these C. M. T. Camps is their spirit of American democracy — a democracy of youth. There are many privately conducted camps which offer opportunities to indulge in outdoor games and to be given athletic instruction. Here are camps however which offer without cost the same opportunity to all young men, whether their parents are wealthy or not. All of these young men have the same course, all wear the United States Army uniform, and each one has the full opportunity to gain the benefits. There are no differences except in accomplishment.

The moral instruction and religious opportunity of the course is one of its important features. Army chaplains have made an extensive survey of the needs. Pastors of churches in the vicinity of the camps have been anxious to help. The young men are made to feel that, although away from home, they are nevertheless in the hands of loyal Americans who share in common with their own parents a belief in things which are just, honorable and righteous. At this time when there are so many disloyal elements who would encourage in our young people a disregard for our Constitution, disobedience of law, and disbelief in Divinity, these camps will do much to form a bulwark of true Americanism and keep our country in the paths of healthy progress.

Upon the oncoming generation rests the future of our nation, and perhaps in a larger sense than we realize at this moment, the future of our civilization and the world's.

Business Backs Citizens' Military Training Camps

DUE in great measure to the activity of Maj. Gen. Charles P. Summerall, U. S. A., Commanding General, Second Corps Area, and author of the foregoing article, many prominent business firms, headquarters of which are located within the limits of the Second Corps Area, have given hearty endorsement to the Citizens' Military Training Camps, 1926. The movement is sponsored by the Merchants' Association of New York, the Chamber of Commerce of New York, and many of the important business and commercial institutions in New York State.

The Merchants' Association of New York, by resolution of its governing board, has requested its members to allow employees to attend camp for the thirty-day period at full pay and without prejudice. This is the usual practice among institutions endorsing the C. M. T. C.

Many nation wide organizations are included in the honor list of institutions and firms which will cooperate this summer in making the C. M. T. C. training camps a huge success. Among these are the American Telephone and Telegraph Company, the General Electric Company, the Radio Corporation of America, the Western Union Telegraph Company, and the United States Steel Corporation, including its subsidiaries, the American Bridge Company, the American Steel and Wire Company, the American Sheet and Tin Plate Company, Carnegie Steel Company, and the United States Steel Products Company. Also included are many organizations which rendered excellent service in the manufacture of munitions during the World War and whose interest in industrial preparedness is still very active. In all there are more than 125 of the larger industrial and financial organizations of the Second Corps Area alone which are lending their efforts and cooperation for the success of the Citizens' Military Training Camps this year.

Training the Veteran for Peace

Brig. Gen. Frank T. Hines, Res.

JUNE 30, 1926, will mark the termination of an activity which was a distinct innovation in Governmental relief for disabled veterans. Vocational training with the ultimate object of rehabilitation and employment is the most novel and one of the most important features of the Government's work for the disabled and is the greatest advance over previous systems of veteran relief in any country. This activity of restoring disabled veterans to a productive economic status was as necessary as binding up the wounds of the injured and nursing back to health those whom disease or injury had disabled.

Under the original Act providing for it, this work which was delegated to the Federal Board for Vocational Education, and later turned over to the Veterans' Bureau, has been a wholly experimental development in adult education, with the difficulty, not present in the pedagogical circles where the education of adults is now receiving much emphasis, of dealing only with disabled men and with these on a scale not in common with any local system.

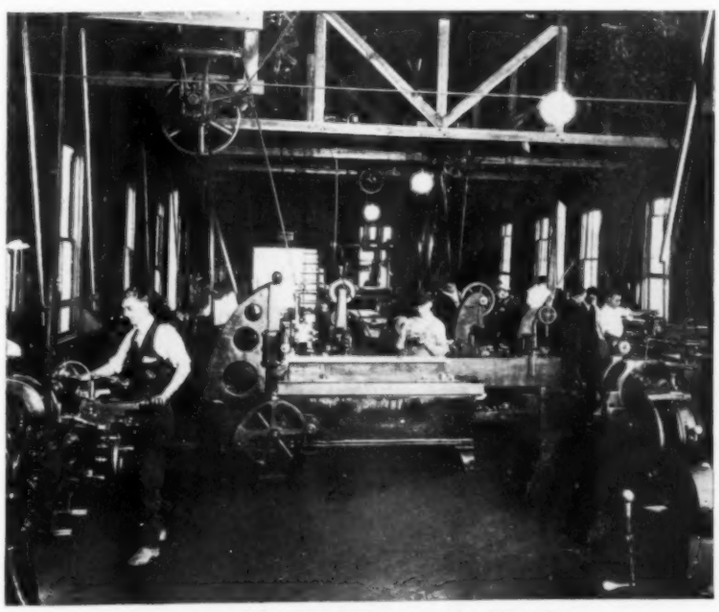
The theory of this rehabilitation is direct and simple: If a veteran's disability prevented him from returning to employment in his pre-service occupation or placed him at a distinct disadvantage in economic competition, and the Government could, by training, prepare him for employment in another suitable and gainful occupation, his increased earning capacity in this occupation would overcome any economic loss due to his disability.

In practice, however, rehabilitation proved a problem complex in the extreme, combining both mental and physical features, and involving a task of no mean proportion. It did not mean simply teaching a man who had lost his right arm to make the left one serve for both—nor accustoming a blinded man to substitute the sense of touch for his lost sight. It meant taking men who were practically helpless from injuries or disease and in addition to the commercial, industrial or professional training, inculcating in them hopefulness, confidence and finally a self-reliance which would enable them to carry on successfully in their newly acquired vocations.

As the work progressed, the policy crystallized of directing the training in wholly practical lines, eliminating any material not directly vocational in character and requiring employability in the occupation selected. In the applications of this policy many educational institutions which give their younger students a broadly cultural background have cooperated with the Bureau by eliminating course material not directly required to secure employment. It has frequently, however, been necessary in order to fit the veteran for less arduous physical work, to provide preliminary training in the line of general education so that his whole educational and occupational level has been improved as a by-product of vocational training.

Except for special types of cases, such as the blind and convalescent, for whom adequate training facilities were not elsewhere available, it was not the policy of the Government to establish schools for the instruction of its beneficiaries. The Bureau's work, therefore, has largely been the selection of proper facilities and the supervision of the training provided, to insure that it led as directly as possible to the requirements of employability. Except for the comparatively small proportion of veterans whose previous education fitted them for advancement along professional lines, training has been given for the most part in industrial and business establishments conducted primarily for production and profit, and on farms, where alone all practical instruction in productive agriculture could be provided. In all over 40,000 facilities have been utilized in the instruction of beneficiaries.

The number of men who have taken advantage of training has far exceeded the early estimates of leaders in this work. A total of 334,494 veterans who applied for training before June 30, 1923, has been rated as compensable and consequently entitled to some form of training, of whom 216,431 have been declared to be in need of rehabilitation and eligible for maintenance and support allowance, while pursuing their courses. Of these latter, 58,873 have been either too seriously disabled to undertake training, or have found it possible to re-enter employment without assistance from the Bureau. 157,558 veterans have entered training with maintenance and support allowance at the rate of $100 per month for single men and $135 or more for married men, depending on the number of their dependents. On



U. S. Veterans' Bureau Trainees in Machine Shops.

February 28, 1926, 107,848 had been rehabilitated, 37,856 had been permanently discontinued either on account of physical incapacity or lack of interest or cooperation, while, 1,879 had died. Over 9,000 cases still in training are being carefully supervised by the Bureau to insure their return to employment before June 30, 1926.

With the enactment of the World War Veterans' Act of June 7, 1924, there arose the necessity for revising certain courses which would normally have extended beyond June 30, 1926, the date set by this Act as the terminal date for rehabilitation activities. The obligation of the Government to provide employment for its trainees still remains and in order that at the end no veteran shall be left with a half finished course, practically all courses have been revised so that employability can be obtained by June 30, 1926.

U. S. Veterans Class in Mechanical Drawing.

At the present time, except for a small number of veterans completing college or other professional courses of high standing, the Bureau's effort is being directed toward securing employment opportunities for the veterans as rapidly as they are rehabilitated.

It is anticipated that over two-thirds of the trainees now completing their work will be employed with the establishment with which they are training. Most of them are receiving wages from their employers which approximate their present productive ability, or in the case of farms, profit by the sale of produce from the farms.

In the case of trainees placed in business or industrial establishments, it has been the policy of the Bureau to urge a sliding scale of wages while in training with increases commensurate with the monthly increase in proficiency, so that the transition to the employer's permanent payroll may be gradual both as affecting the trainee and his employer.

With this policy and continuation of the excellent cooperation of employers in all types of business, it is anticipated that the closing of rehabilitation activities on June 30, 1926, will be marked by really completed service and satisfactory employment to practically all who are now in training, the only exception being those who entered too late to allow completion of any satisfactory course.

Over 400 occupations are represented among the trainees, poultry farmers predominating and after that in numerical sequence, general farmers, mechanics, electricians, bookkeepers and architectural and mechanical draftsmen. Among the poultry farmers are a group of over 100 blind and partially blind men who have been trained by the Bureau in this occupation. As strange as it may seem to the uninitiated, these men have been exceptionally successful, the suitability of poultry raising as an occupation for the blind and partially blind (ex-service men) having been well demonstrated in this field of training. The majority of men with this disability were found to be from rural environments and had as a background some form of farming experience to build upon.

The training was given them through the medium of special instruction of the most practical nature in schools and on modest farm projects acquired by the trainees. All phases of modern poultry husbandry from incubation to marketing of the products have been taught and absorbed by these men with varying degrees of success.

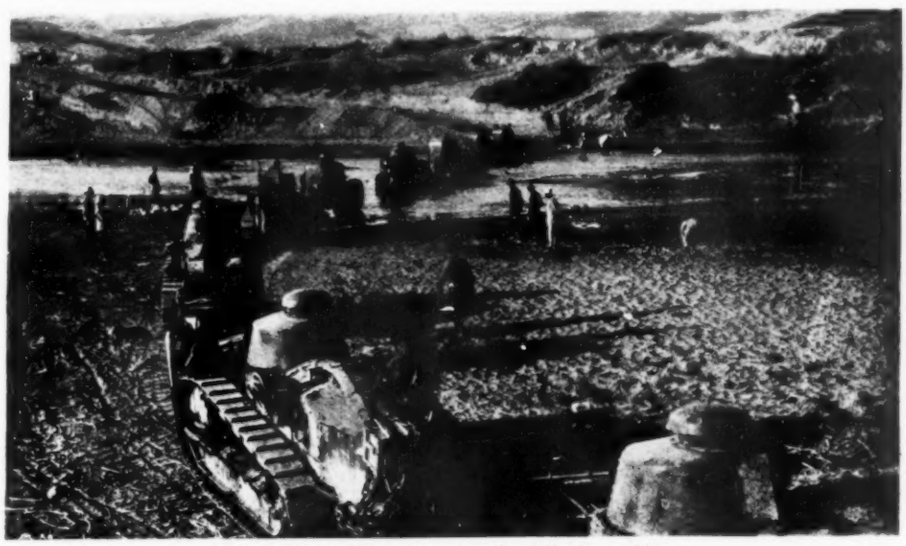
Rehabilitation in poultry raising has made it possible for many of these men to return to their home localities as independent, self-sustaining and useful people and the consciousness of being able to once again contribute something to the economic and social betterment of their communities has served to establish rehabilitation in its real meaning. Whatever the cost, however, it has been largely justified. Instead of the contemplation of thousands of broken, impoverished men left neglected throughout the country to work out their own salvation as must have been the case without vocational training, we have today the spectacle of these same thousands restored, self-reliant and hopeful, marching along, step by step, and shoulder to shoulder with their comrades and competitors in all branches of the commercial, industrial and professional world.

Over 100 Blind or Partially Blind Veterans have been Trained in Poultry Farming by the Veterans Bureau.

Modern Warfare vs. The Riffians

Lt. Col. N. E. Margetts (F. A.) G. S. C., U. S. A.

EARLY in August, 1925, the Secretary of War directed that confidential orders be issued detailing a War Department General Staff Officer to proceed without delay to Paris and report to the Military Attaché for the purpose of making arrangements to get to the French Zone in Morocco to observe activities going on there, the nature of which very little was known.



French Tanks Moving up for the Attack on Bibane.

Upon arrival in Paris August 22, it was found that the French War Office would not receive an American officer as official military observer, but did not object to the United States sending an officer in any other capacity.

After some delay, the representative of the Associated Press in Paris agreed to provide the observer with credentials as a war correspondent, but without obligation to write for publication as such. A visit to the Minister of Foreign Affairs resulted in receiving a personal letter addressed to Marshall Lyauty, Resident General in French Morocco, authorizing the entry of the observer into the French Zone as a war correspondent.

Investigation developed the information that all transportation accommodations by air and sea were engaged for at least ten days in advance.

The Military Attaché at Madrid was asked to obtain permission from the Spanish Government for the observer to pass through the Spanish Zone en route to the French Zone. This request was promptly granted, including an invitation for the observer to visit the Spanish Zone en route.

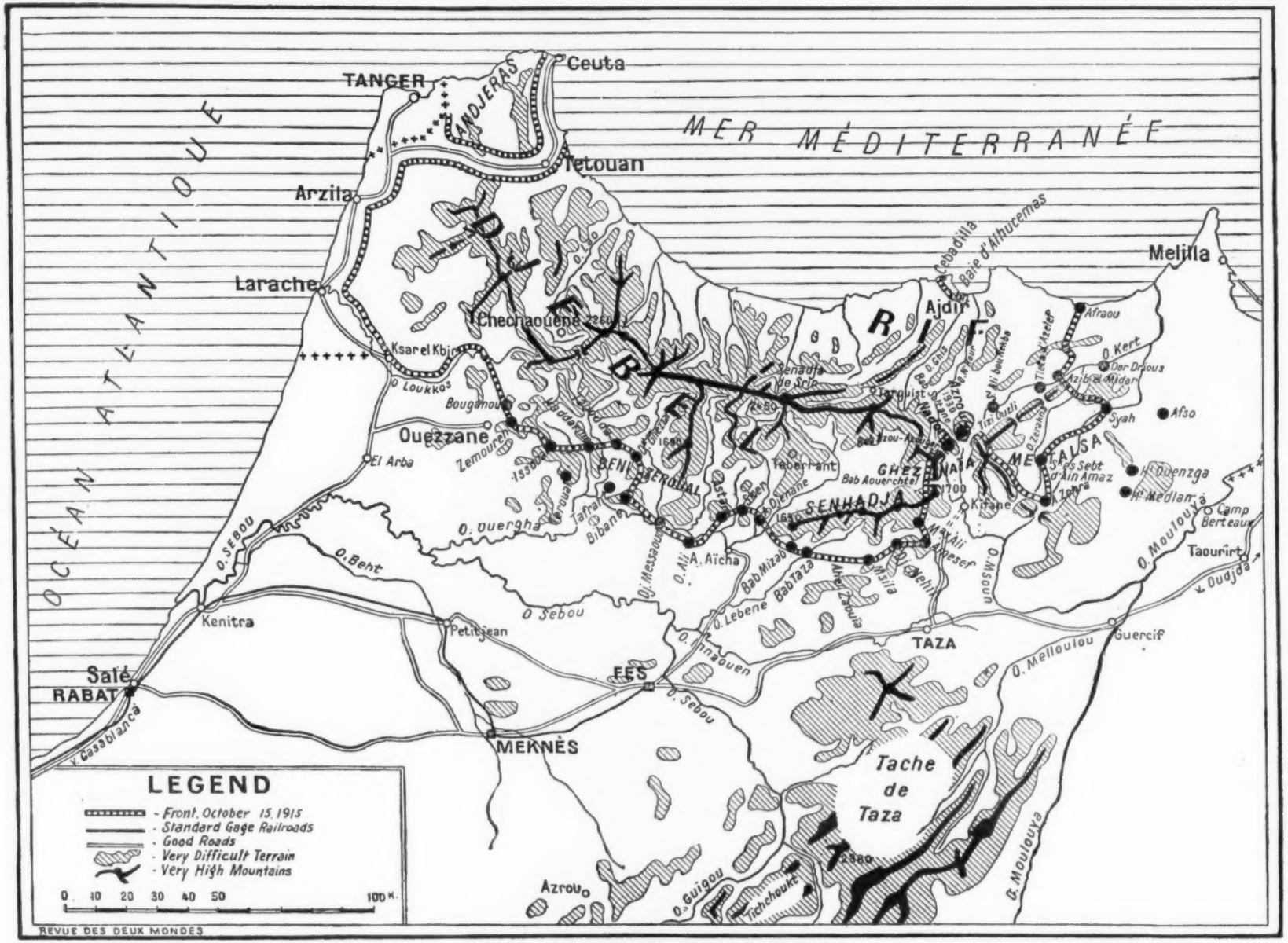
The observer left Paris August 26, passed via Madrid, Algeciras, Gibraltar, and arrived in Tangier August 28. Mr. Malcolm Blake, the American diplomatic agent there, arranged for the observer to visit Tetuan on the 29th in order to pay his respects to the Spanish Commander.

Tetuan is headquarters of the Spanish Army in Morocco. It is located about 80 kilometers southeast of Tangier, and is reached by auto over a good macadam road which traverses a narrow corridor strongly guarded by a series of block houses on either side and located at intervals of from 600 to 1,000 yards; each block house surrounded by wire entanglements, is connected by telephone communication with a large center. The block houses are held by a detachment of 12 to 15 men whose instructions in case of attack are to hold the post and not leave to reinforce any other attacked post.

The road to Tetuan is closed between dark and daylight, and it is reported much contraband is run over this road during the night.

Tetuan is the extreme outpost in this part of the Spanish Zone. In addition to the corridor which is kept open to maintain direct contact with Tangier, there is a macadam road and 60-cm. railroad running north to Ceuta on the Mediterranean Sea. This port is the supply base for the troops at Tetuan and in the Tangier corridor. The garrison at Tetuan consists of combat troops of all arms, and numbers about 8,000 men. The advance lines are only three or four kilometers distance and for the past year the Riffians have been firing on Tetuan with artillery, from strong positions to the southeast.

The observer was warmly received by the Spanish Commander and shown such activities as time would admit. We returned over the same road to Tangier the following day. August 29th was spent in conference with Mr. Blake and visiting officials of the city. At 6 A. M., August 30th, the observer left Tangier in auto en route to Larache. This latter place is about 90 kilometers southeast of Tangier, located on the Atlantic Coast at the mouth of



French and Spanish War Zones in Morocco.

the River Loukos. It is reached over a good macadam road or by sea, although there is no harbor nor docks at which to land; no railroad connects Tangier with Larache.

The P. M. of August 30th was spent here in order to pay respects to the Commanding General who commands the Atlantic strip of the Spanish Zone. Here a number of staff officers were met who proved good contacts during a later visit to the Spanish Zone.

A Machine Gun Outpost in Morocco.

At an early hour August 31st, the journey by auto was continued and by noon El Ksar El Kebir, the last Spanish town before entering the French Zone, was entered. A few kilometers south of this town is the boundary and before being allowed to proceed in the French Zone it is necesary to submit to a rigid customs inspection. After a clearance is issued no further interruptions occur, and the journey continues over a good road that follows the coast, passing through the important towns of Sk el Arba, Kenitra, Sale, across the river Sebou, and we entered Rabat, the present Capital of Morocco, about 6 P. M., September 1st. Here the Sultan of Morocco, Moulay Youssef, has his residence, and here the French Resident General has his headquarters and conducts the administrative affairs of Morocco.

During September 2 and 3, the observer remained at Rabat, reporting to the Resident General, and presenting press credentials to the Press Bureau. At daylight September 4th, the journey was continued to Fez. The most convenient means of transportation is by auto. The road is very good macadam, and passes through the city of Meknes, which was used as headquarters for Marshall Petain during active operations in 1925.

There is a standard gage railroad from Rabat to Fez, but little used for passenger transportation. Accommodations are poor and the line runs north through Kenitra then to PettiJohn, Meknes, and finally to Fez. Most passenger traffic and all tourist is by autobus or automobile.

The observer arrived at Fez, September 4th, at 6 P. M., twenty-two days after leaving Washington.

Headquarters of the French Army in Morocco was located at Fez, which was also to serve as headquarters for the observer during his stay in Morocco. Comfortable quarters were found at the Hotel Trans-Atlantic and several days were spent in becoming oriented.

Tractor Drawing a 75-mm. Gun into Position.

Road Conditions on the East Front after One Night of Rain.

There was an atmosphere of great activity everywhere, as operations were going on in all the sectors. It was Marshall Petain's purpose to arrive at the assigned objectives before the rainy season set in.

155-mm. Howitzers Moving to the Front.

At the time of arrival of the observer in Fez, there were war correspondents from the United States, Great Britain, France, Italy, and Switzerland. The position of the observer was soon found to be a delicate one, officially accredited as a war correspondent and known at Army Headquarters to be a General Staff Officer from Washington, and during the daily conference of war

Airplane View of the Attack and Capture of a Moroccan Village.

correspondents with the press censor it was felt the observer was considered with some misgivings.

It was only after several weeks and with the influence of Marshal Petain and General de Chambrun, that the suspicion attached to the observer was dissipated and the confidence of the Army Commander and his staff as well as that of the sector commanders was gained and the observer was free to visit any part of the front at any time.

Now let us look at the enemy who has been able to maintain himself against a force of 150,000 French and 125,000 Spanish, armed with all the latest weapons developed by the Great War, that could be employed in a country like Morocco, well organized, disciplined, and trained in methods of warfare.

The people commonly called the Riffs, inhabit the mountainous country in the northern part of Morocco, located mostly in the Spanish Zone of Influence. For generations they have lived an independent life; for generations they have lived in an atmosphere of war. When not actually engaged in war against Christian invaders, they have carried on a feudal warfare among themselves. They are hardy mountaineers, with great powers of endurance, and thoroughly familiar with the mountainous terrain over which they operate. They are accustomed to hardship and privation, have a very low standard of living, depend entirely for a livelihood upon their herds and crops, and although of Mohammedan faith, are of Berber origin and not so religiously fanatic as the true Arab. Their women do not veil the face. These Riffian tribes have had very little contact with European influence and civilization. This condition is confined largely to those tribes inhabiting the country north of the Ouergha River. South of this river the majority of the tribes have come under French influence and are more peaceful and inclined to agricultural pursuits.

Among the most powerful tribes that inhabit the Riff Mountains is found the Beni-Ouriaghel, having a most decided taste for domination. From this tribe came Abd-el-Krim, a man of intelligence and foresight and ability to organize and command. He was born in 1882. His father was the Caid of Ajdir. Krim, from early youth, realized how important it would be for him to be trained in European ways. He followed the Spaniards, gained their confidence and became Cadi of Melilla, which office he held from 1915 to 1919, when by reason of his intrigues he came under suspicion and was dismissed by General Sylvestre, the Spanish commander.

He returned at once to his tribe, plunged into rebellion, and forced his leadership upon the tribes which he called one after the other to "dissidence."

Although it is reported he reigns by terror, nevertheless a great number of subjects obey his rule and acknowledge the prestige which he has won by real successes. The French admit he is an adversary to be taken seriously, whose ability it would be foolish to deny.

He has taken precautions for the continuity of his work in case he should disappear, and has established a veritable family oligarchy with dependable lieutenants, chief among them being his brother Si-Mohammed-Abd-el-Krim who

Mehallas near Kifane.

has a good reputation as a a soldier.

Krim's first real success against the Spanish occurred in the Melilla Sector in 1921. He was responsible for the uprising of the Moors which resulted so disastrously to Spanish arms. This entire Spanish front was abandoned and in the retreat to Melilla over 15,000 men were captured or killed. Included among them was General Sylvestre, the Spanish Commander, who had dismissed Krim in 1919. He disappeared and was never heard of again.

Abd-el-Krim's House Being Bombed from the Air.

One of the important results of the operations against the Spanish troops has been to give the Riffs much experience in the methods of modern warfare, and large quantities of arms, ammunition, and other supplies have fallen into the hands of the Riffs, as well as large numbers of Spanish prisoners who are held for ransom and exchange either for money, arms, ammunition or other needed supplies.

In 1924, with continued success against the Spanish which resulted in their withdrawal to the coast and the abandonment of a large part of the Spanish Zone, the spirit of disaffection gained ground rapidly in French North Morocco. The tribes situated near the political frontier were only awaiting an opportunity, in fact a signal to rise in rebellion and to call upon the tribes to the south of the Loukos, the Ouergha, the Lebene and the Msoun, to follow them. These tribes had been peaceful and loyal subjects up to this time.

Toward the beginning of 1925, Abd-el-Krim hoped to extend his authority over the Riffians, Djebalas, and other groups of Northern Morocco capable of furnishing over 100,000 warriors. To arm them he had available modern rifles, some artillery and machine guns, and abundant ammunition, the results of his former conquests. He counted on new captures to enlarge his supply of ammunition. This was to be a sudden attack directed against the French. He also expected an uninterrupted flow of contraband.

This force of over 100,000 warriors were hardy mountaineers fearing neither fatigue, privations or death, incomparable marchers, infantry and marksmen of the first order, eager for plunder and booty, skilled in taking cover and from concealment making sudden attacks with rifle in hand and knife in belt, upon the order of their leaders. Such was the force Abd-el-Krim was able to command against the French early in 1925 when he launched his attack which forced the French to withdraw to the south, fighting a delaying action, and hoping reinforcements would arrive in time to prevent the capture by the Moors of Fez, Taza, and other important cities.

At the beginning of August sufficient reinforcements from France and Algeria had arrived and the Army of Morocco was organized. The Army was organized with seven infantry divisions, Corps and Army troops, with General Naulin in command. With headquarters at Fez, he held the Army troops and the 3rd Moroccan Division in reserve in the vicinity of Fez.

The theater of operations, which was all territory north of the line Meknes, Fez, Taza, Guercif, to the boundary between the French and Spanish zones, was organized into

Moroccan Warriors: A Group of Partisans Near Bibane.

three sectors. The East Sector was commanded by General Boichut, with headquarters and corps troops located at Taza. The sector was held by two divisions.

The Center Sector was commanded by General Marty, with headquarters at Fez, and Corps troops to the north. The sector was held by two divisions.

The West Sector was commanded by General Pruneau, with headquarters and Corps troops at Ain Defali. The sector was held by two divisions.

The troops of all arms available for the organization of the Army totaled about 150,000 men, not including certain auxiliary native units, i. e., Goums, Mehallas, Makhzens, and Partisans.

The Goums are mixed infantry and cavalry troops usually stationed in isolated regions; the other auxiliary native troops are called for certain periods of time when certain operations are projected.

With the arrival of Marshal Petain in July and the organization of the Army in August, active operations commenced on the front of all three sectors. The missions of the Army assigned by Marshall Petain were:

(1) Recovery of all territory abandoned in April and re-establishment of most important parts on right bank of the Ouergha;

(2) The main project was to be a wide extension of French occupation to the north of Taza, toward the end of September and beginning of October, with a view to occupying the frontier of the Riff.

Marshal Petain knew it would take a long time to carry out this plan because of the absence of roads and trails and the difficulty of the mountainous terrain over which it was necessary to operate, and against an enemy trained for generations in guerrilla warfare.

Ammunition Supply in Morocco.

Soon after the arrival of the observer in Fez, it was learned an important operation was to begin on September 11th for the purpose of widening the two bastions of Teroual-Tafrant and Taounat, and pacifying the powerful tribes of the Beni-Zeroual and the Mtious, who had joined Abd-el-Krim during his advance southward from April to July, 1925.

Accordingly, the observer in his capacity as a War Correspondent, was authorized to accompany the advance and was instructed to report to M'Jara, which was to be headquarters of General Pruneau, Commander of the West Sector, during the operations, and was to be the initial point of concentration of the 69th Brigade of the 35th Division.

No transportation was furnished by the military authorities, and it was necessary for the observer to find some sort. After much difficulty, a Ford was rented and the observer left Fez at daylight September 9th for M'Jara. The driver did not know the route, and the available maps being poor, the Camp was not reached until about 8 P. M. the same day. It was expected accommodations in the form of shelter and mess would be furnished, but it was found no provision was made for newspaper men and the observer was informed he would have to provide the necessary transportation, sleeping and messing facilities while visiting at the front. Much discomfort was experienced on this, the first visit to the front, but on future visits precautions were taken to provide the necessary means of transport and existence.

The troops concentrated at M'Jara consisted of a mixed brigade (69th), i. e., Infantry, 5 Bn's Colonial; Artillery, 1 Btry. 155-mm. How.; 2 Btrys. 75-mm. Guns; 1 Btry. 65-mm. Mountain Guns; 1 Btry. 105-mm. Mountain Guns; Tanks, 1 Company (15 tanks); Armored Cars 6; Cavalry, 1 troop Spahis; Balloon, sausage, 1; Air Service, 3 squadrons; Supply train (5 ton trucks); each battalion of Infantry accompanied by its mule train.

155-mm. Howitzers in Position Awaiting the Advance North of Kifane.

At 4 A. M., September 10th, the troops began to move out from M'Jara en route to Teroual which was the advance post at this time and which was to be the jump off line of the 69th Brigade at daylight on September 11th in the first day's advance, to Haddarine and Ain Bou Aissa.

What appeared to be chaos and confusion among the troops during the early hour

movement, soon straightened out into an orderly column on the march. The terrain was rough and the tanks, armored cars and supply trucks had great difficulty in getting over the poor road. However, by nightfall all elements were in their positions for the jump off next morning.

Conferences were held at which the Division and Brigade orders were freely discussed and the Division and Brigade Commanders made a personal inspection of the units that were to participate in the advance.

During the night the camp was subjected to harrassing fire from the enemy. At daylight, with troops ready for the advance, the Artillery (all pieces of which were in position for direct fire, except the 155-mm. Howitzers) opened up short but intensive preparations, sweeping the crests in front with high explosive shell. Upon lifting of the fire the advance began, preceeded by tanks and armored cars, followed by the infantry, accompanied by artillery fire from guns in position and by mountain artillery following the troops. The principal resistance met with was from the flanks that had not come under artillery fire. The Colonel commanding the Brigade with his staff (to which the observer was attached) followed the axis of advance about 1,000 yards in rear of the front line and although equipped with powerful field glasses, the observer did not see a single Riffian during the day's advance.

The advance of the troops was as rapid as the intense heat and difficult terrain would admit of and the day's objective, Haddarine and Ain Bou Aissa, was reached by 11:30 A. M. without much resistance from the enemy. These posts are the most advanced ones in the French Zone in this sector and it is here where all signs of roads end, and further advance must be made unaccompanied by wheel transport of any kind. Haddarine and Ain Bou Aissa were among the first posts to feel the weight of attack by the Riffs in April, 1925. Both were captured and a tragedy occurred at Ain Bou Aissa where the post held by a lieutenant and sixty men was blown up the day before the relief column arrived and the entire detachment killed.

The afternoon and night of the 11th of September were devoted to organizing the positions and getting up supplies preparatory to the advance, on September 12th, to Amjot. The Riffs kept up a harrassing fire on the camp during the night and a number of casualties resulted. There was much suffering on the part of men and animals because of lack of water. None was to be had until the river was reached next day, but as this is not unusual in this country during the hot months, the troops accept the condition without complaint.

The Great Caid of Northern Algeria.

By daylight, September 12th, all the artillery was in position and the troops ready to move out after the artillery preparation. This was completed by 5:30 A. M. and the advance begun. Very little resistance was encountered and the river was reached at an early hour. It was practically dry; stagnant pools only were to be found and men and animals drank together of water that under normal conditions it is doubtful if even animals would touch. The objective for the day was reached by noon and organization of the positions immediately begun. This was to be the limit of the advance and it was necessary to take every precaution to prevent successful counter-attacks by the Riffs.

The troops that participated in the operations of the 12th consisted of Infantry, Mountain Artillery, with detachments of Engineers and Medical Corps, with airplanes in the air bombing the villages in advance of the troops. Such supplies not carried on the troops were transported on the backs of mules, organized into large transport columns, carefully guarded by cavalry and following closely the advancing troops. The above description of a two days' advance into the Riffian country is an example of the great problem confronting France and Spain in the attempt to subdue Abd-el-Krim and his tribesmen.

This is a war in which the only objectives that present themselves to a well organized force is a piece of terrain to occupy, the enemy will not stand before the advance of a strong column. There are no roads, railroads or centers

Algerian Goums: Native Mixed Infantry and Cavalry under the French.

of strategical importance to be occupied; their villages are small and widely scattered, and abandoned by the inhabitants upon the approach of an enemy. Added to the above difficulties are other and more serious obstacles to overcome. There are the intense heat, lack of water, absence of roads and even trails, and the difficult terrain. All these obstacles are aids to the Riffian soldiers in combating an invading force, and it was very apparent to the observer during the seven days he was with the French on this operation that the employment of European soldiers in this country and against such an elusive foe could not meet with success until after years of acclimatization.

The Advance Supply Base at Ain Aicha.

The greatest danger that confronts a column which penetrates into the hostile territory, is the possibility of a forced withdrawal due to lack of water or supplies for men and animals.

The method adopted by the Riffs, and which has proved so costly to the Spanish as well as French forces, is to fall back before the advance of a strong column and harrass the advancing column with rifle fire from behind rocks and other shelter. When the column halts it is a signal for the scattered Riffians to gather in small squads and increase the harrassing fire, and upon the first indication of a withdrawal or retreat the enemy attacks with great courage and ferocity. They never fail to inflict heavy losses upon a retreating column.

Terrain Near Kifane.

At least 75 per cent of the troops employed by the French in Morocco are Colonials, and there is no doubt this fact is responsible for the French success and the Spanish failure in their respective zones of influence. In other words, the French fight fire with fire, while the Spanish employ about 10 per cent of native troops, the other 90 per cent being true Spaniards.

The observer remained three days with the French troops in front of Amjot. During the day the troops were busy organizing the positions and the convoys transporting supplies, heroic work under the burning sun, and the long climb from the valley to the heights occupied. During the night the Riffs kept up a constant harrassing fire on the camp, and flares were fired at irregular intervals lighting up the surrounding country for the purpose of detecting any Riffs in an attempt to creep up and throw hand grenades into the trenches.

The above is an example of the nature of warfare carried on by the French across their entire front, after assuming the offensive early in August, and continued until all objectives were reached by October 15th, when the front stabilized and preparations were begun to meet the terrors of the rainy season.

The defensive organization consisted of reorganization of the theater of operations into an East and West Sector, the East commanded by General Marty, with headquarters at Taza, and the sector to be defended by two divisions with a reserve and advance supply base at Dar Caid Metbou.

The West Sector to be commanded by General Boichut, headquarters at Fez, the sector to be held by three divisions with a division in reserve at Meknes and Fez, advance supply base at Ain Aicha, M'Jara, Ain Defali and Quezzan, army headquarters to move from Fez to Rabat where

the army commander would be located beside the Resident General (Steeg) who was to assume complete control of French affairs in Morocco.

The front of 240 kilometers was to be held by 60 battalions composed of Algerian, Moroccan, Senagalese, Zouaves, and Foreign Legion, no complete French units to be employed, all units commanded by French Officers and N. C. O. All advance posts were to be battalion posts, equipped with artillery and other auxiliary weapons, surrounded by barbed wire, and adjacent posts within supporting distance of each other. In front of this defensive line at intervals is a curtain of Partisans, or Volunteers, from the pacificed tribes who, supported by the French, are employed to protect their tribal territory against raids by hostile tribes from the north. By November 15th, when the new organization went into effect, the French Zone was pacified and conditions of life became normal again.

During the Advance North of Kifane, October 1, 1925.

The end of active operations in the French Zone found the situation in the Spanish Zone about the same as it was before the Riffian attack on the French in April, 1925. The Spanish occupation consists of control over a narrow strip extending from El Ksar El Kebir to Tangier on the Atlantic Coast; the Tangier-Tetuan Corridor; the road from Tetuan to Ceuta; a small bridge head at Ajdir; and the well organized sector of Melilla.

A Group of Mehallas: Permanent Infantry and Cavalry at the Disposal of the Native Chiefs.

The greater part of the Spanish protectorate is controlled by Abd-el-Krim. It is a country of high mountains, no roads and no railroads. Method of transportation is by mules or women and over narrow trails. It is a country difficult of development even in peace time, and occupied by warlike tribes the Spanish have never wholly pacified.

On the other hand, France occupies that part of Morocco containing great potential wealth. The vast plains and valleys easy of agricultural development and affording abundant pasturage for herds of cattle, goats, sheep and camels, are peopled by tribes more inclined to peaceful pursuits.

France has been most successful in the administration of her protectorate. Good roads and railroads connect all the large cities and important centers, and others are being built. Modern cities are being built alongside the old Arab cities. French officials respect and protect the people in the execution of their civil and religious laws. Today the Mosques and other places of Mohammedan worship are held as sacred in the eyes of the European as they were in the days of the Prophet.

The French high officials receive the Moroccan officials in their homes, entertaining them at receptions and dinners, and accept in return invitations to the homes of Moroccan officials.

Outstanding service rendered by Moroccan officials or soldiers is promptly rewarded by the bestowal of the Medal of the Legion of Honor, which has a great appeal to the oriental mind. The treatment of native troops by French officers is always kind but firm, and there are few instances where these troops have been disloyal to their officers. The French are no doubt meeting with great

succes in their civilizing influence over a people who have progressed so little in modern ways of civilization, and who today in their markets and large cities are carrying on in much the same way as was done a thousand years ago.

In conclusion it can be safely stated the first requisite necessary to insure success in the war in Morocco is roads, more roads and railroads. The question of transportation is the greatest of all obstacles that confronts the military. In the absence of roads, wheeled transport cannot accompany the light columns which must be mobile, and must transport needed supplies on mules or camels organized into convoys which are vulnerable to attack and must be carefully guarded by strong detachments.

Mountain artillery alone can accompany the columns beyond the point where roads end. Tanks and armored cars have not been able to render much service except where roads were available and then the intense heat will not allow the men to remain inside for long.

Cavalry cannot be used in advance of the column operating in mountainous country. It affords a splendid target for the concealed and widely distributed Riff riflemen. As a result, cavalry is used on the flanks and rear and guards the convoys. No European cavalry is employed in the French Zone. The cavalry used consists of natives mounted on small Arab ponies, hardy and with great power of endurance.

The French do not employ poisonous gas against the Riffians, although it is freely used by the Spaniards who have a small gas plant in operation near Melilla.

The Air Service has operated with varying success and failure. With success in carrying limited supplies to posts cut off by the Riffs in the early months of 1925; by photographing terrain and furnishing details useful to commanders of advancing columns and accompanying infantry with its fire; by liaison with front line troops and the rear; by reconnaissance; by bombardment of villages, sensitive points and of herds of cattle; and finally by evacuation of seriously wounded from the front, where the sick and wounded are normally transported to the rear ambulance on the backs of mules.

The Air Service has failed to destroy the morale of the hostile tribes and to inflict serious loss on them. The difficulty encountered by the Air Service lies in the fact that there are no tangible enemy objectives to attack, no railroads, no roads, no important towns or cities, villages widely scattered and abandoned on the approach of airplanes, cattle are taken to water and fed during the night, and the limited Air Service available to cover this vast and mountainous terrain.

The result is limited bombardments at varied intervals which do not have a lasting effect on the minds of the people.

Artillery up to 155-mm. caliber can be used to good effect where roads permit movement, but in the last analysis the principal arm is the Infantry equipped with machine guns and mountain artillery on pack mules, the whole made as mobile as possible while retaining a maximum of striking power. This with the continued construction of roads, will solve the problem now confronting the French in Morocco.

(Editor's Note: Illustrations for this article were furnished through the courtesy of the Editor, Field Artillery Journal.)

Cincinnati Has Enthusiastic Industrial Preparedness Meeting

INTEREST in Industrial Preparedness was accelerated by the visit to Cincinnati, Wednesday, April 7, 1926, of the Assistant Secretary of War, Col. Hanford Mac Nider, accompanied by Maj. Gen. C. C. Williams, Chief of Ordnance; Col. H. B. Ferguson, Office of the Assistant Secretary of War; and Maj. Dwight K. Shurtleff, Office of the Chief of Ordnance. Hon. Benedict Crowell, President of the Army Ordnance Association and former Assistant Secretary of War, came on from Washington to attend the meeting of the Cincinnati Post, Army Ordnance Association.

Col. Charles L. Harrison, Chief, Cincinnati Ordnance District, gave a luncheon for forty at the Queen City Club. In a few remarks prior to introducing the speakers, Colonel Harrison expressed his desire to organize an Advisory Board, from among those present at the luncheon, to assist the District Chief in the broader problems which arise. The Assistant Secretary of War and General Williams discussed War Planning of the Army and the Ordnance Department, and Mr. Crowell told of some of the difficulties he had as Director of Munitions during the World War. He also spoke of the activities of the Army Ordnance Association.

As the visitors were going on to Chicago and had already stopped in Pittsburgh and Louisville, no activities were planned for the afternoon prior to the meeting of the Cincinnati Post, Army Ordnance Association, at 5 o'clock at the Cincinnati Chamber of Commerce, at which Colonel Harrison presided. In spite of a wet and miserable day, this meeting was attended by more than 100 members of the Cincinnati Post and guests who had been invited from among the Regular Army, National Guard and Reserve Officers, engineering and trade societies, and other business men and manufacturers.

After a few introductory remarks, Colonel Harrison introduced Mr. Crowell who described the organization and purpose of the Army Ordnance Association as outlined in its Constitution, and told how it assisted the Ordnance Department in war planning and the growth and formation of local posts.

General Williams emphasized the difficulties and time required for the manufacture of ordnance, because in the main it consists of special articles of which there is no peace-time production in commercial manufacture. Colonel MacNider then delivered a forceful address on Industrial Preparedness. In closing he said:

"We are in no sense a militaristic people. We do not want war, but we want the whole earth to know that if we are forced to fight we are in a fine state of preparedness. That is our best insurance against any possibility of aggression or insult by any other nation, and we are not keeping our plans secret by any means. We are letting everybody know that we are ready, although we are not anxious to fight. We do not intend to foster a fighting spirit, but we realize that the mobilization of our industries is of the utmost importance in a preparedness program."

The party was entertained at dinner by Colonel and Mrs. Harrison and left for Chicago later in the evening.

Tetryl

Development of a Manufacturing Process at Picatinny Arsenal

C. J. Bain

A RESUME of the difficulties involved in the procurement of explosives during the World War revealed some very interesting and at the same time rather alarming facts, among which was the decided uncertainty connected with the obtaining of a satisfactory grade of tetryl. The characteristics of this explosive are such as to fulfill all the requirements of a booster explosive, namely, high velocity of detonation, satisfactory sensitivity to detonation by initial detonating agents, and insensitivity to detonation by shock. In addition, tetryl had been successfully used abroad for several years as a booster explosive, during which time the technique of manufacture had been constantly studied and developed. Tetryl possesses still another advantage in that the raw materials required for its manufacture do not draw heavily upon the raw materials needed in the manufacture of other explosives.

Semi-Works Tetryl Plant at Picatinny Arsenal.

It would seem, therefore, that the decision of the United States Government to adopt tetryl as the booster explosive was based on sound technical and economic reasons. Accordingly, with the entrance of the United States into the World War, contracts were placed with various explosive companies for the manufacture of tetryl, the method employed being based mainly upon information received from abroad. It was realized that difficulties would be experienced in the production since the background for the method of manufacture was considerably limited. There was lacking that vast amount of experimental data which is obtained in the development of a process, and also, what was still more vital for smooth operation, that intimate knowledge of a process gained through personal contact with the entire development. Thus throughout the duration of the war, manufacturers were engaged in producing an explosive of which the manufacturing technique was not well understood. Under the stress of emergency production, relatively little time could be devoted to an experimental study of the various factors upon which the quality of the finished tetryl depends.

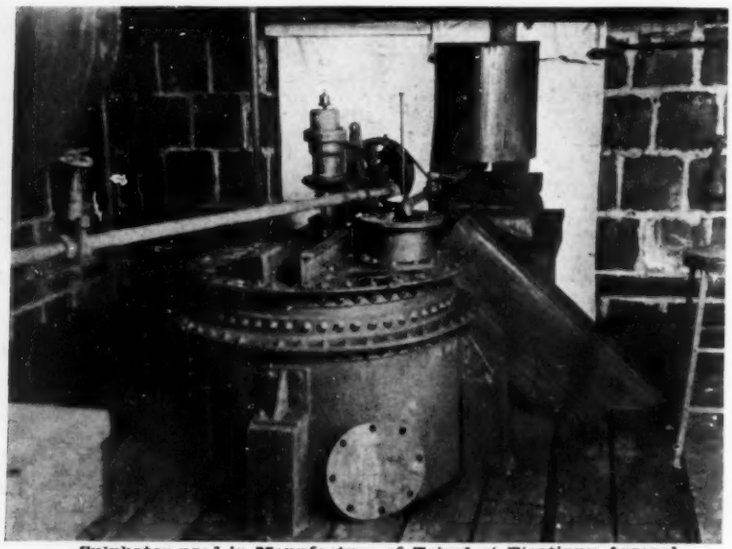
The paramount issue being increased production, the quality of the explosive gradually dropped to a point where it was considerably below that regarded as high grade tetryl.

Before proceeding with the development of a process for the manufacture of tetryl, it might not be amiss to illustrate by the following analysis, the difference between tetryl considered as high grade and that actually produced in the United States:

	High Grade	U. S. Manufacture
Melting point.....	128.5-129.1°C.	127.5-128.5°C.
Per cent Acidity....	not more than .08	not more than .08
120°C. Vacuum test (gas evolution)...	not more than 4.0 c.c. in 40 hrs.	25 c.c. in 20 hrs.

Although the comparison shows that the American product was inferior in quality, few, if any, cases of proven malfunctioning with this material are on record. This is, therefore, one more indication of the spirit and resourcefulness of United States manufacturers, in that they were able in a comparatively short time to get into the production of a well behaved explosive, although only the most meagre manufacturing data were available. On the other hand, the comparison shows that the tetryl manufactured in the United States was of a decidedly lower quality than the best foreign tetryl. This point is clearly brought out by the wide variation in melting point and stability (120°C. vacuum test) of the two grades. It is also known that the higher the purity of an explosive, the greater is the percentage of perfect functioning, this being decidedly more noticeable after extended storage. It is, therefore, of vital importance that ammunition loaded during peace time for use in the national defense should have explosive components which can be depended upon to function after an indefinite period of storage. The best assurance of this is to use only explosives whose purity is the highest obtainable. Improvement in the quality of tetryl was, therefore, essential.

The early work on the production of a high grade of tetryl, centered around the purification of crude material



Sulphator used in Manufacture of Tetryl at Picatinny Arsenal.

manufactured according to war-time practice. Three diffeernt methods of purification were investigated:

(1) Recrystallization from acetone,
(2) Recrystallization from nitric acid,
(3) Boiling in water of material ground to 150 mesh.

Each of the foregoing methods was intensively studied in the laboratory and semi-works plant at Picatinny Arsenal. Besides obtaining complete information on the merits of each process, sufficient fundamental data were obtained to indicate definitely the line of future investigation. The specific information obtained in connection with this work was that tetryl having a melting point of at least 128.5°C. could be obtained by each of the purification methods, but in no case did any of the samples give less than 4.0 c.c. of gas in the 120°C. vacuum test. In addition to the inability of any of these methods to produce a tetryl having a stability test of less than 4.0 c.c. of gas, the methods are open to criticism on other lines.

1. Acetone being miscible with water does not permit a removal of the acid while the tetryl is in solution. This is a decided disadvantage as it has been found almost impossible to reduce the occluded acidity of crude tetryl much below 0.05 per cent by boiling in neutral water, while experiments have shown that the occluded acidity can be readily removed by washing a solution of tetryl with warm water, where the solvent is immiscible with water.

2. The use of nitric acid as a purifying medium requires additional boiling treatments to remove the acidity. It also necessitates the use of special equipment on account of the corrosive nature of the acid and it introduces unwarranted hazards because of the explosive nature of the solution of tetryl in nitric acid.

3. It was found that purification by boiling in neutral water was of no avail unless the tetryl was ground to pass a 150 mesh screen. Considerable danger is connected with the grinding, besides it reduces the tetryl to such a degree of fineness that it cannot be conveniently loaded since it does not flow well in the hoppers of the pelleting press.

Although the results obtained in the early investigation led to negative conclusions, still there was established a wealth of valuable basic data which through careful analysis, indicated generally the points demanding special consideration. It was evident that an improved process must include the following:

1. The crude tetryl should be improved in quality so as to absorb a portion of the burden from the recrystallization process.

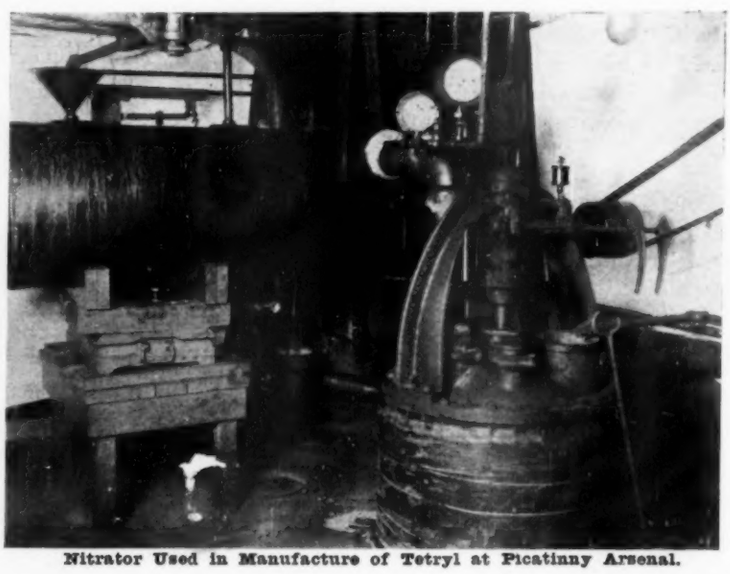
2. Recrystallization should be by means of a solvent which is not miscible with water to permit removal of acidity by warm water washes.

3. Control of recrystallization would be required to insure the finished tetryl having free flowing qualities.

Laboratory investigation along these lines was pursued intensively until the fall of 1924, at which time it was felt that sufficiently favorable results were on hand to warrant a trial of the improved process on a semi-works scale. It is almost axiomatic that the design of equipment based on laboratory results will require at least minor changes before a smoothly running process is obtained. Also certain modifications will have to be made in the process. Taking tetryl from the laboratory to the semi-works proved to be no exception to the rule, and numerous minor changes were made in the original process. It cannot be stated that all the difficulties encountered were easily overcome, but by close cooperation between the laboratory and semi-works a process was evolved. The ability of this process to produce tetryl of high quality was shown by the manufacture of 500 lbs. of tetryl in 15-lb. batches, the quality of which was in every way equal to that of high grade foreign manufacture.

Description of the Process

It is a well established fact that dimethylaniline reacts violently when added to a nitric acid of sufficient strength and quantity to insure the addition of the five nitro groups.



Nitrator Used in Manufacture of Tetryl at Picatinny Arsenal.

It is, therefore, necessary to dilute the dimethylaniline to a point where the heat of reaction can be easily controlled. It was found that the proper dilution could be obtained by means of 96-99 per cent sulphuric acid, using one part by weight of dimethylaniline to 14.4 parts of sulphuric acid. The dimethylaniline was added to the sulphuric acid in a jacketed kettle, sufficient agitation being maintained to secure a perfect solution of the dimethylaniline in the sulphuric acid. In this step in the process it is extremely important that side reactions (such as the formation of sulphonic acids) be suppressed and the temperature was, therefore, held below 30°C. during the entire sulfation.

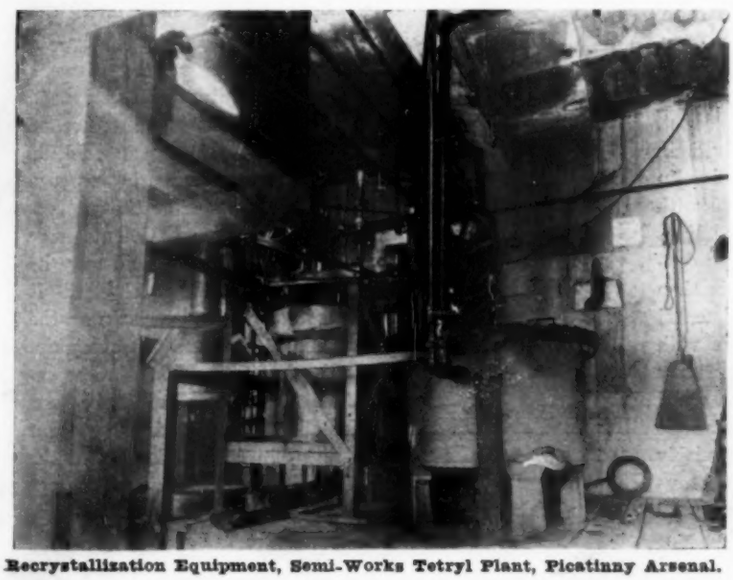
Boiling Tubs, Semi-Works Tetryl Plant, Picatinny Arsenal.

The next step in the process is the nitration of the dimethylaniline sulphate to tetryl. It had been almost a universal custom in this country to use straight nitric acid as the nitrating acid. This, of course, necessitated the use of special equipment, such as duriron or enameled ware. Hence, in the development of the process, stress was placed on the use of a mixed acid. The acid finally chosen as satisfactory had the following composition:

Nitric acid	66.7 per cent plus or minus 0.5 per cent
Sulphuric acid	15.8 per cent plus or minus 0.5 per cent
Water	17.5 per cent plus or minus 0.5 per cent

An acid of this nature may be handled in standard equipment without fear of undue corrosion, and at the same time has been found to have all the properties of a good tetryl nitrating acid. 9.6 parts by weight of this acid are required to nitrate properly one part of dimethylaniline. Any amount in excess of this figure did not result in a higher grade of tetryl, while the use of a less amount resulted in an immediate falling off in quality of the crude material. The nitration was carried out in a jacketed nitrator, the dimethylaniline sulphate here added to the nitrating acid, sufficient agitation being maintained to secure immersion of the dimethylaniline sulphate and tetryl. In this stage of the process the temperature must be carefully controlled. Too low a temperature during nitration causes sluggish action which may at any time become violent and uncontrollable, while too high a temperature causes numerous side reactions, especially oxidation. The optimum temperature must, therefore, be a compromise between the two. The nitrating temperature adopted was 68-73°C. In working within these limits the nitration proceeded smoothly and without the formation of an undue percentage of the products of side reactions. Although nitration takes place with fair rapidity it was found quite necessary to resort to a cooking period of twenty minutes, after all the dimethylaniline sulphate had been added. The cooking of the charge at 68-73°C. for this length of time, allows complete nitration of the dimethylaniline sulphate added during the last part of the nitration, at which stage the nitrating acid is much reduced in strength and, therefore, reaction is relatively slower.

The nitration being completed, the next step is the separation of the tetryl from its spent acid. Up to the time of the writing of this article, the recovery of the tetryl has been accomplished by drowning the whole charge in water and decanting the sour water. In order to realize as large a yield as possible the nitrator charge was cooled to 50°C., at which temperature a large proportion of the tetryl precipitated from the spent acid. Cooling to 50°C. also allowed the use of a smaller amount of drowning water and thereby reduced solubility losses. It has been found that using 100 parts of cold water (not over 30°C.) to one part of tetryl gives a drowned charge in which the resulting temperature and volume of water is such as not to seriously affect the yield. In order to accomplish the greatest possible removal of acid in the drowning wash, the charge was thoroughly agitated with air for ten minutes, settled 15 minutes and the sour water decanted through a series of catch boxes. At this point a relatively large amount of acid is still found on the surface of the tetryl crystals and they are, therefore, given an additional cold water wash, the entire operation being carried out as described for the drowning wash. The tetryl now is compara-



Recrystallization Equipment, Semi-Works Tetryl Plant, Picatinny Arsenal.

tively free from surface acid, at least to the extent that further cold washing would not be warranted. It does, however, contain considerable occluded acid and is, of course, contaminated with the products of the side reactions which took place during nitration. With reference to the latter, experiments have shown that they are quite readily hydrolized by boiling water and can in this manner be effectively removed. In addition, boiling water more readily enters the tetryl crystal than cold water and thus assists in reducing the occluded acid. These are the main reasons for following the cold wash by two hot water washes. Here again a compromise must be made between efficient removal of impurities and losses by solution of the tetryl in hot water. In this connection it has been found that two water boils (95°C.) of 1¾ hrs. each, were sufficient to accomplish the desired purpose. In each of these washes, 50 parts of water to one part of tetryl was used. After each wash the charge was settled 15 minutes and the wash waters decanted. The charge was then washed into a centrifuge where the moisture content was reduced to approximately 10 per cent. It must then be dried before it passes to the recrystallization process. The drying was accomplished in approximately 48 hours by means of a tray dryer, the circulating air being maintained at 30-35°C. At this temperature there is little chance of decomposition which might be initiated by the occluded acid which is still present.

The crude tetryl as it is delivered from the dryer analyzes as follows:

Melting point	not less than	128.5°C.
Acidity	not more than	0.15 per cent
Insoluble in acetone	not more than	0.50 per cent
120°C. vacuum test		8.0 c.c. in 8 hrs.

While the melting point indicates satisfactory purity, the high acid content and low stability test lead one to suspect that deterioration would be encountered in a relatively short period of storage. Consideration must also be given to the fact that the crude material contains what is known as a high percentage of "fines," so much in fact that trouble would be experienced if an attempt is made to use it in loading. Now it has been long recognized that one of the most efficient ways of removing acidity from a solid is to dissolve the material in a solvent not miscible with water, and wash out the acidity with warm water. Also while in solution it can be readily filtered to remove insoluble material and after washing, recrystallization may be so controlled to give a uniform and free flowing product. To accomplish this the air-dried tetryl was dissolved in 4.5 times its weight of benzene, and filtered. The dissolving temperature was held at 68-70°C. which coupled with an excess of benzene insured the absence of plugged lines which would be likely to occur if a solution of greater concentration were used. After filtration, the charge is then ready for removal of the acidity. Numerous experimental runs have demonstrated that three 15-minute washes with the water at 68-70° are required to effect the necessary purification. The volume of water in each case was equal to the volume of the benzene solution. During the entire wash sufficient agitation was used to practically emulsify the two liquids, although as soon as the agitation was stopped, the liquids separated completely in approximately 10 minutes, at the end of which time the wash water was drawn off. After the final wash, the charge is recrystallized by cooling to 25°C. To cool to a point lower than 25°C. does not result in a sufficient increase in yield to compensate for the extra time and cooling water required. This is especially true as the benzene mother liquors are fed into a steam distillation still where the benzene is distilled to be used again in the process and the tetryl recovered for further purification. If the mother liquors were again used without distillation, sufficient impurities might be introduced to contaminate the finished tetryl. As soon as the benzene mother liquors have been decanted the recrystallized tetryl is washed into a centrifuge and the excess water removed. It is then dried for at least 48 hours in a tray dryer, the temperature of the circulating air being held at 65-75°C.

The importance of careful manipulation in the recrystallization cannot be too fully emphasized. Factors which might appear to the layman to be of minor importance are worthy of serious consideration if one desires a product of highest quality. In the investigations at Picatinny Arsenal it has been found essential to pay particular attention to the following points:

1. The recrystallizing apparatus must be either lead or enameled. The use of iron, brass, or allied metals at any point in the equipment has always resulted in the tetryl failing to give less than 4.0 c.c. of gas in the 120° vacuum test.

2. Distilled water is almost essential to guarantee every batch being of high quality.

3. No water can be present during crystallization of the tetryl from the benzene solution. The presence of water results in its being occluded in the tetryl crystal during recrystallization and is not removed by drying. This occluded water reacts to form picric acid in the stability test with a resulting high evolution of gas.

Provided these points are recognized the method described is capable of producing tetryl of exceedingly high quality as shown by the analysis of the 500 lb. lot of tetryl manufactured in accordance with the method described.

500 lb. Lot P. A. 111 of 1925.

Melting point	129.23°C.
Total acidity	0.005 per cent
Material insoluble in acetone	0.06 per cent
120°C. vacuum test	2.53 c.c. in 40 hrs.

Yet the process cannot be considered as completely developed. A number of phases are still worthy of consideration and further investigation is warranted along the line of effecting greater economy. In all manufacture of explosives, it is highly desirable that the spent acid be recovered in order to avoid or at least reduce the expense of disposal of the sour water. This phase of the process is now under investigation. Laboratory experiments have shown that at least 70 per cent of the spent acid may be recovered by gravity filtration of the nitrated charge. It has also been shown that the acid charge may remain on the filter for at least one hour without danger of heating up. These results seem to attest the feasibility of a similar experiment on a larger scale. A filter has accordingly been designed and will soon be installed in the semi-works plant to further test the practicability of this modification of the process. It was realized that the investigation could not stop with recovery of the spent acid, but that the disposition of this spent acid must also be considered. Again the usual disposition of spent acid is to recover the nitric and

sulphuric acids by denitration. Experimental work has already shown that tetryl spent acid lends itself to efficient denitration and that the recovered nitric and sulphuric acids may after concentration be used in the manufacture of tetryl without danger of decreasing the purity of the product. Thus the present indications are that recovered acid will be absorbed within the process which will materially assist in reducing the cost of manufacture.

Another phase which is receiving serious consideration is the control of the crystal size of the finished tetryl. That this is of importance will be realized when it is known that the production of satisfactory booster pellets is largely dependent upon the material being of uniform crystal size and free flowing. A change in the crystal size invariably necessitates a change in the setting of the dies and punches of the pellet press, while a material which is not free flowing frequently chokes in the hopper of the press. It is also desirable that the material be free from dust in order to reduce its toxicity. As military explosives are made for use in ammunition careful attention must be given to the ease with which they can be loaded. For this reason semi-works experiments are in progress which it is hoped will definitely establish the speed of agitation and rate of cooling required to produce a finished tetryl which has the characteristics desired by the Loading Department.

This paper outlines the progress which has been made at Picatinny Arsenal in the development of the manufacture of tetryl and it is hoped that data have been presented which will be of benefit to those engaged in the same or similar manufacture. In closing the writer wishes to state that what has been accomplished was due to the hearty cooperation of all the employees at Picatinny Arsenal who were in any way connected with the development of the process.

Directors of Army Ordnance Association Hold Annual Meeting

THE National Association of Manufacturers, the Reserve Officers' Association of the United States, the National Industrial Conference Board, and the American Society of Steel Treaters have been formally invited to participate in the Eighth Annual Meeting of the Army Ordnance Association. The invitations were authorized by resolution by the Board of Directors of the Army Ordnance Association at their regular annual meeting in New York City, February 26, 1926. The Directors also announced that the annual meeting of the Association will be held this year at the Aberdeen Proving Ground, Maryland, Friday, October 8th. The resolution inviting these organizations to participate reads:

"WHEREAS the Secretary of the Association has already undertaken preliminary negotiations with the several organizations hereinafter mentioned with a view to having them participate in the Eighth Annual Meeting of the Army Ordnance Association which will be held, subject to the approval of the Secretary of War, at Aberdeen Proving Ground, Maryland, Friday, October 8, 1926, and

"WHEREAS it has been the custom in the past to invite such organizations to participate in the annual meetings of the Association as a means of interesting their respective members in the development of ordnance, and

"WHEREAS the officials of the Reserve Officers' Association of the United States, the National Industrial Conference Board, the National Association of Manufacturers and the American Society of Steel Treaters have, in preliminary conferences, indicated their willingness to have their respective organizations participate; be it therefore

"RESOLVED that the President of the Army Ordnance Association extend to the above mentioned organizations a formal invitation to participate in our Eighth Annual Meeting."

The Directors' Meeting was held in the offices of Gen. Guy E. Tripp, Vice-President of the Army Ordnance Association, 150 Broadway, New York City. Hon. Benedict Crowell, President, presided. The report of the Secretary, Maj. R. L. Maxwell, Ord. Dept., U. S. A., for the year ending December 31, 1925, was submitted and approved. The Secretary outlined in his report the activities of the Association during the past year, its healthy growth in membership, and its plans for the present year. Col. Chas. Elliot Warren, C. A. Res., Vice-President, Irving Bank-Columbia Trust Company, New York City, Treasurer of the Army Ordnance Association, submitted his report showing the satisfactory financial condition of the Association.

Resolutions encouraging the formation of local posts and authorizing the presentation of an R. O. T. C. trophy to be known as the Army Ordnance Association Trophy, were adopted. The trophy will be a caliber .22 Springfield Rifle and will be awarded to the member of the Reserve Officers' Training Corps who, in the judgment of the officials in charge of such competitive matches as may be held by that organization, is declared the winner.

This is the second trophy to be authorized by the Army Ordnance Association. The first is a special caliber .30 Springfield Rifle, also known as the Army Ordnance Association Trophy, and is awarded to the winner of the President's Match at the National Rifle Matches.

The following officers and directors of the Association were present at the meeting: Hon. Benedict Crowell, President; Gen. Guy E. Tripp, Vice-President; Gen. Samuel McRoberts, Director; Col. James L. Walsh, Director; Col. Chas. Elliot Warren, Treasurer; Maj. R. L. Maxwell, Secretary.

Editorial

War Reserve Supplies

WE can accept as encouraging evidence of progress toward the goal of a balanced program of preparedness the apparent recognition of the importance of Reserve Supplies by the responsible heads of the War Department. Not that recognition means a solution of the problem, but a beginning has been made and united effort toward the solution is in prospect. The discussion of this subject by Maj. Gen. C. C. Williams, Chief of Ordnance, and the comments of Hon. Dwight F. Davis, Secretary of War; Maj. Gen. Fox Connor, Deputy Chief of Staff; and Maj. Gen. Hanson E. Ely, Commandant of the Army War College, in this issue of ARMY ORDNANCE speak for themselves.

The Army Appropriation Bill for the fiscal year 1927, awaiting final approval of the Congress, for the first time since the World War provides for replacement of a small portion of stocks of war reserve ammunition and in that very concrete manner begins to give effect to the War Department policy of maintenance of an ammunition reserve.

Speaking on this subject before the Army War College recently, Secretary Davis stated the problem in these words:

"In laying the foundation for an effective army in time of need, we must be sure, therefore, that we are properly evaluating the factors necessary to make such foundations secure. I believe that it is a fair statement to say that the effectiveness of an army will depend in reality upon the product of several factors, the two principal of which are our ability to utilize manpower and our ability to supply it with essential materials. If either is zero, the resultant is zero.

"All of the above is so obvious that it might appear unnecessary to mention it. But there is abundant proof even in our own life time of the failure of armies and countries to realize the growing importance of munitions and the difficulties and length of time required to produce them.

"Let us be perfectly honest about our own World War experience in the matter of fighting materials. We declared war in April, 1917, and the Armistice occurred in November, 1918, some 19 months thereafter. We spent enormous sums of money in the procurement of supplies. We exerted a national effort, that for size, intensity and diversity has never been equalled. The American Army during all that time, was practically completely dependent upon our Allies for its supplies of aircraft, artillery and artillery ammunition. We could not have fought one single battle during our entire participation in the World War in accordance with our present conception of the art of war, if we had had to rely upon munitions manufactured in America in response to American orders. The extravagant way in which we used our supplies after they had been issued to the troops is another indication of the lack of understanding of the problem."

ARMY ORDNANCE can perform no greater service than to assist those in authority in the effort to have everyone engaged in the perfection of preparedness plans realize that personnel mobilization is ineffective and industrial mobilization impossible unless adequate war reserve supplies are available and ready to use when war clouds darken our peaceful skies and mobilization no longer appears in the fanciful role of theory but confronts us in all of the grim aspects of reality.

Training

TRAINING, certainly military training, has a special meaning for each of us which is colored by the individual interest in a particular part of our national defense system. During the spring and summer all components of our Army will assemble in camps for Regular Army, National Guard, Organized Reserve, Reserve Officers' Training Corps and Civilian Military Training Camp training and at all of these camps Ordnance plays a most important part. The Regular Army, National Guard and Organized Reserves will meet again old acquaintances on the active list of standard Ordnance items of issue and occasionally welcome new friends in the form of recently developed Ordnance undergoing service test. In the Reserve Officers' Training Corps and Civilian Military Training Camps many young men will be brought into close contact for the first time with Ordnance material. Let us hope that they will learn to appreciate its value and the necessity for daily care and attention, both from the standpoint of economy of operation of training camps and assurance that the Ordnance will function properly when needed.

The Ordnance Department trains its own personnel and organizations by stationing Ordnance companies and detachments at arsenals and camps, where preliminary instruction is given and experience gained by actual performance of current maintenance of Ordnance in storage and in service. In addition to the training at arsenals and camps, selected Ordnance enlisted men are sent to the Ordnance Specialists' School, Raritan Arsenal, New Jersey. This school gives courses for armorers, carpenters, clerks, electricians, machinists, artillery mechanics, auto mechanics, munitions workers and welders, and to non-commissioned officers courses in maintenance, depot operation, ammunition and administration to prepare them for the grade of Staff Sergeant.

The assembly of the various branches and components of the Army, with the inevitable mingling of interests which comes about in a training camp, leads to a better understanding of the relation between the profession of arms and the purely civilian life of the nation which must add to our ability to respond to the requirements of any emergency.

Factory Plans

FROM the mass of verbal and written discussion of the subject of industrial mobilization certain specific ideas are beginning to emerge. Historians and economists as well as industrial and political leaders are studying the subject in earnest and, as with any other worth while question of national importance, we can expect to see distinctive schools of thought develop from this study.

However, it is to the more specific plans of industrial mobilization that we would call attention. Regardless of differences of opinion as to general principles involved or the exact manner of organizing and operating the overhead controls, when we get down to the producing plants which are to actually do the work we can all agree that each individual organization must have its "Factory Plan" and this plan merits the best effort of everyone connected with the plant. This phase of industrial mobilization is new and, in the final analysis, most vital. The factory plan will be just as good as the factory makes it. Anything that anyone outside of the factory organization does toward the perfection of the factory plan must be regarded as assistance, and without detracting from the value of this assistance, it must be borne in mind that it is the duty and privilege of the factory to make its own plans. The efficiency of execution of plans will depend largely upon the familiarity of plant personnel with the details of the plans.

Factory plans are as necessary in Arsenals as in commercial plants. Each must know what is to be done and deliberately consider how to do it in a minimum of time and with a minimum expenditure of human effort and material.

The factory plans are the foundation of the industrial mobilization structure and like all foundations must be soundly built of good seasoned material which experience advises is of sufficient strength to support the load. With a foundation so constructed building can proceed while discussion continues as to the exact form and style of the pinnacle or pinnacles which shall ultimately adorn the completed building.

The Chief of Ordnance

THE recently announced reappointment of Maj. Gen. C. C. Williams, U. S. Army, to be Chief of Ordnance for a period of four years from July 16, 1926, has not only received the general and sincere approval which it merits but has aroused an interest in the office itself. History tells us that it was not until February 8, 1815, almost forty years after General Washington took command of what was soon to become the United States Army, that the organization of the executive branch of the Government was sufficiently stabilized for the Congress to create the post of Chief of Ordnance. During this preliminary period the office existed in fact under a variety of names, the favorite being Commissary of Artillery Stores. The first Chief of Ordnance to enjoy the title as well as the responsibilities of the position, Col. Decius Wadsworth, had eleven predecessors bearing the various titles given to the office. In the one hundred and eleven years which have intervened since Colonel Wadsworth assumed the title we have had twelve incumbents.

From	*To*	*Rank and Name*
8 Feb., 1815	1 June, 1821	Col. Decius Wadsworth
30 May, 1832	25 Mar., 1848	Col. George Bomford
25 Mar., 1848	10 July, 1851	Col. George Talcott
10 July, 1851	23 April, 1861	Col. H. K. Craig
23 April, 1861	15 Sept., 1863	Brig. Gen. J. W. Ripley
15 Sept., 1863	12 Sept., 1864	Brig. Gen. G. D. Ramsay
12 Sept., 1864	20 May, 1874	Brig. Gen. A. B. Dyer
23 June, 1874	22 Jan., 1891	Brig. Gen. S. V. Benét
23 Jan., 1891	29 Mar., 1899	Brig. Gen. D. W. Flagler
5 April, 1899	22 Nov., 1901	Brig. Gen. A. R. Buffington
22 Nov., 1901	15 July, 1918	Maj. Gen. William Crozier
16 July, 1918	To date	Maj. Gen. C. C. Williams

The growth of the office has been gradual and therefore substantial, and the high standard of service which the nation has come to expect from those selected to fill it is an inspiration to all who are directy or indirectly connected with Ordnance.

The Chief of Ordnance fills one of the key positions in our system of national defense because it is to him that the Army looks not only for technical guidance in Ordnance matters but for an uninterrupted supply of serviceable Ordnance for training in peace and combat in war, while the Ordnance Industry—both actual and potential—depends upon him to minimize the shock of mobilization and demobilization by careful preparation and timely warning.

The continuation of General Williams in this position is but due recognition of his unusual ability as a leader. ARMY ORDNANCE extends congratulations and confesses faith in the eternal fitness of things.

Ordnance Laboratories

FEW of the many commentators on modern war have neglected to emphasize the highly technical and scientific nature of the weapons of today. Those of us who claim some familiarity with Ordnance realize even more fully the truth and importance of this fact.

For many years the Ordnance Department has been developing its principal laboratory facilities so that today it has three of the most complete laboratories in the country. At Watertown Arsenal, Watertown, Mass., the Metallurgical Laboratory is one of the best in point of personnel and equipment. At Picatinny Arsenal, Dover, N. J., the Chemical Laboratory merits the same high appraisal. Here are studied the many chemical problems connected with the development of military explosives. Probably no higher form of scientific investigation is conducted anywhere than at the Ballistic Laboratory at Aberdeen Proving Ground, Maryland, as members of the Army Ordnance Association who have attended the Annual Meetings at the Proving Ground can readily testify.

Thus American ordnance is assured accurate study and investigation in these most important stages. In the Ordnance Laboratories machines and processes are developed to insure peace and protect our lives and institutions. To them we look with as much pride as we do to our clinics and our commercial laboratories which aim to develop and improve their products only after stabilized society is assured.

Historical

Trusts, Trunnions and Traditions.

Edited by Maj. William A. Ganoe, Inf., U. S. A., Historical Section, Army War College.

"I GIVE and bequeath two heifers or cows to the Captain and Officers of the First Artillery Company to be kept as a stock constantly and the increase or profit of these cows yearly to be laid out in powder or bullets." So ran the will and testament of Capt. Robert Keayne at his death in 1656, Boston, Mass.

As this is the first instance on record where a cow actually begat ammunition, so it is the first note in America struck for industrial and military preparedness. Captain Keayne, besides bequeathing the cattle, gave "a room for an armory," "five pounds for the encouragement of that Company to be laid out in pikes and bandoliers," and "five pounds more towards the erecting of a platform planked underneath for two mounted pieces of ordnance to stand upon."

His interest in this subject is illustrated by the amazing pains he took to explain the future needs and conduct of the organization. A shed of boards was to be raised over the platform to keep the pieces dry "and preserve them from sun and weather and this to be raised in the most convenient part of the training place in Boston where it shall be most fit for that use and where at a convenient distance against some hill or rising ground there may be a good butt or kind of bulwark raised of earth that may receive the shot of those pieces and may be free from endangering any that may unexpectedly pass by or behind the butt in case they should overshoot, which butt may be cast up or digged at the bottom of a hill without any charge by the Company themselves, in two or three of their training days and my end in this is, that the Company may be trained up (or so many of them as desire it), in the use, exercise and experience of the great ordnance as they are in their muskets that they may learne how to traverse, load, mount, level and fire at a mark, etc., which is as needful a skill for a soldier as the exercise of their ordinary arms. I suppose the Country will willingly lend the Company two such pieces for so good a use as this is, if the town itself hath none such to spare and will give them a barrel of powder or two to encourage them, to begin a service that will be so singularly useful for the country, the bullets will be most of them found and saved again if the hill or butt against which they shoot be not so low and narrow that they overmount and shoot aside at random, now as many of that company or others which desire to learn that art of gunnery (so needful for every Captain and officer of a Company to be experienced in) they may enter their names to be scholars of the Great Artillery and to agree that every one that enters his name may give so much for entry and so much a year afterwards as you do at the Artillery which money will serve to lay in provision of powder, shot, sponges, budge-barrels, cannon baskets and some allowance to the Mr. Gunner that shall take pains to instruct them, if there cannot be some skillful and sufficient man found, that will think the honor of the place to instruct such a society in so noble a service recompense sufficient that they have an opportunity not only to exercise their own skill, but to do good to the country and to willing scholars that so thirst after experience as we see the Captain and rest of the officers of the small Artillery do freely expend their time to instruct others in the best skill themselves have attained, and look at it as reward enough that their pains are accepted and the company edified by it, besides there being many ship masters and gunners that resort to this country to have good skill in this art, the Company I doubt not upon their request might have their help sometimes and direction herein and he that is chosen to this place may have the title of the Captain of the great Artillery or Mr. Gunner and there may be a time appointed once in a week or fortnight for the scholars to meet to spend two or three hours, either forenoon or afternoon, for their instruction in it. Now all that meet cannot expect to make every one a shot apiece or but one man two shots at one time and the rest may observe as much by the manner of their performing it as if they had done it themselves, and for further encouragement to help on this exercise besides the five pounds given before towards the platform and the other five pounds for pikes, etc. . . . ."

So was perpetuated The Ancient and Honorable Artillery Company of Boston, the first company to receive an independent charter in North America. Having begun its activities in 1637, it advanced steadily through nearly three centuries and is still carrying on in Faneuil Hall under its claim of being the oldest military organization in the United States. Accepting with loyal response the trust placed upon them by the Company's first commander, Captain Keayne, the leading citizens of Boston became members of the unit, donated gifts for its upkeep and took active interest in its drills and ceremonies. So respected did it become by the community that a law of the Colony later on forbade any Town Meeting or any other military practice in Boston on the day set apart for the training of the Artillery Company. In 1645, its members joined forces with Myles Standish and his pilgrim soldiers in an expedition against the Indians. In King Philip's War, in England under Cromwell, and in the French and Indian War, a large representation of the Company took an active part, many of them becoming leaders.

In 1738 there took place in the organization that change which usually betokens a signal advance in morale. After having worn since its inception a breast plate and steel hat or coat and breeches of leather indiscriminately, the

Company adopted a standard uniform. No attempt had been made previously to have articles of apparel of the same type, design or character. So the year mentioned marks, it is believed, the first instance in this country of a military unit using a single mode of dress.

All these developments pointing toward self-respect, it was but natural that prominent and progressive patriots were members of the Company. They appeared among the Sons of Liberty at the Boston Tea Party. Such pressure was brought to bear by them that in 1766 four guns were bought in England by the General Court of Massachusetts and presented to the Artillery Company. Later, Dawes, one of the members and the minute man who made the famous ride on April 19, 1755, was instrumental in purloining these cannons from under the close supervision of the British at the outset of the Revolution. Since these four pieces constituted the only ordnance of the Colony, they were naturally highly sought. Hidden in carts and barns, they led a checkered career until they showed up mounted at Bunker Hill, where, during the battle, two of them were captured. The other two, named the Hancock and Adams, practically went through the Revolution in freedom's cause.

So The Artillery Company gave of its time, money, effort and men in every succeeding conflict of the United States. Its lists include, in the Revolution, Generals Heath, Lincoln, Brooks, and Hull. It furnished officers in Shay's Rebellion, in the War of 1812, and the Mexican War. One hundred and forty of its members took part in the Civil War, Generals Banks and Lawrence, Colonels Walker and Bradley, and Major Maynard being among that number. So, in the succeeding wars of '98 and the late great World War conflict, the Company gave a high percentage of its personnel and largely of its effort and experience to the active service of its country. They were valuable men who had received a trust, were carrying on a tradition, and had sacrificed on the altar of training. Their ancient duties gave birth to strong and brilliant records. The beginning of the Company was fraught with unselfishness, self-denial and enthusiasm, the very ingredients of true patriotism. Its uniforms, its ceremonies, its respectability, its principles, from the sacrificial bequest of Captain Keayne to its humblest gift to the World War, tended toward the making of *esprit* and that high standard found only in those institutions in America which can look backward for long distances upon the trodden paths of righteous pride.

On the first Monday in June, the little Company with its antique uniforms, its old formations, and its proud members, marches through the streets of Boston to listen to a sermon in the church. Then the unit remembers in touching fashion those who have died during the year. After that it proceeds to the Common where it holds a parade and a drum head election for its officers after the fashion of its three centuries of existence. When it leaves its armory on this occasion, it marches to the State House to receive the Governor and escort him to the church and Common where later he will receive the resignations of the officers and give commissions to the new ones. The ensuing ceremony radiates an atmosphere which is laden with age and length of service. The Governor fastens around the neck of the Commander-elect the old gorget, the ancient badge of a commissioned officer, and then hands him the halberd, the old-time badge of his authority.

Today the President of the United States and the King of England are two of the honorary members of the Company. Vice-President of the United States, Mr. Dawes, Ex-Secretary of War Weeks, United States Senator Butler, past Governors of Massachusetts, Congressmen, Mayors, and men of high political, financial and business standing, belong to its personnel by right of decent. Any officer holding an active commission in the United States Army or Navy is admitted to emmbership simply by paying the initiation fee of twenty-five dollars, and is thereafter exempt from all assessments unless he should participate actively in the Fall field day when he pays only the actual expenses of that day. On this basis quite a number of Regular Army and Navy officials are members of the organization.

The present commanding officer is Frank L. Nagle of the *Textile World*, whose father was Gen. James Nagle of the Ninth Army Corps in the Civil War. Doubtless Captain Nagle, who has ever been active in the proper propulsion of military affairs in the Government, must feel pride in commanding a company which Miles Standish, Benjamin Franklin, John Quincy Adams, and Calvin Coolidge have seen march through the streets of Boston, a Company which trod every battlefield in New England in the first centuries of the Company's existence, was active in settling the towns of the frontiers, was loyal to the Colonies in the Revolution, was first in organizing churches and supporting them, was a constant friend of the public schools and foremost in the introduction of manufacturing and extension of trade.

The finger of Captain Keayne has beckoned through three hundred years, his halbert has pointed the way, and the high efforts of large-minded men shall yield even greater services, for as they look into the simple words of his will and testament they behold an inspired handwriting:

> "I would make it my dying request to our first Artillery Company (if there shall be such a Company in being when it shall please God to take me out of this miserable world) many know what my earnest endeavors and desires hath been to promote and encourage what I could since the Lord hath brought me into this country and my desires have not been altogether frustrated for out of this small Company the Lord hath raised up many a well experienced soldier that hath done good service and hath been of good esteem both here and in our native country and therefore my grief is the more to see this sometime flourishing and highly prized Company that when the country grows more populous this company should grow more thin and ready to dissolve. * * *"

Theater of Operations

Edited by Maj. T. A. Clark, Field Service, Office of the Chief of Ordnance

Role of the Ordnance Department

IN the last issue we spoke of Command and Staff—the role of each and the distinction between them. We shall now point out the place and function of the Ordnance Department in respect to command and staff.

War follows natural laws just as does everything else on this planet. If I place a marble on the level plate glass top of my desk the marble will remain there unless I move it with my finger. If the glass be slightly inclined the marble will roll toward me until I stop it with my finger. In war, if the enemy has gained access to our territory he will remain there unless we push him off. If he is advancing within our territory or toward our territory he will continue the advance unless we stop him. In this illustration of extremes we use the same natural agency in each case—force. To start or stop the motion of the marble I use force. To start or stop the motion of the enemy's hordes the commanding general uses force. As the commander of my finger I make a decision to use it in a certain way for a certain purpose—I reach out and push the marble. Fortunately for me I am not encumbered with the details which go to make up the force at my command in that finger. I am not directly concerned with the blood flow, which constitutes the supply and evacuation keeping the finger alive nor with the skin which shelters it nor with the nail which affords the weapon for my use. Neither am I called upon to direct in detail the operations of each tiny muscle the resultant of which gives me the force at my command. All these things are looked after by an automatic natural "staff" which operates in accordance with my intentions but without my detailed direction. This is the human machine. The war machine approaches the human machine as an ideal. The war commander decides to push the enemy in a certain way or to stop him at a certain place. He has, at his command, a force with which to do this. But the agencies going to produce and maintain this force are not automatic as in the case of the human body. In the latter there may be and probably are thousands of centers and sub-heads of actuating agencies which control the finger—we do not know. We know little of the human "staff," but as I say, we must approach it as an ideal. Therefore we analyze our proposition and attempt to determine the least number of heads under which we can classify all our actuating agencies necessary for the production and the maintenance of our military force.

Our experience has placed this number at four, viz.: Personnel, Intelligence, Operations and Supply. Under these four heads can be classified all the agencies needed for our purpose. Our military staff has been divided then into four heads G-1, G-2, G-3 and G-4, respectively. The Ordnance Department, being strictly a supply branch, comes squarely under G-4. Now that we know our place and who our "boss'" is, let us examine briefly into the other agencies under G-4 so that we may know our relations with our neighbors. Operating under G-4 are all the supply branches, signal, engineer, medical, quartermaster and finance as well as ordnance. He controls and coordinates transportation, traffic, water supply, construction of all kinds including maintenance of roads and bridges, utilities, property accountability, salvage and burial, including disposal of captured animals and matériel, hospitalization and evacuation of sick and wounded men and animals, trains, including operation of transportation pools, supply statistics and electric light and power. He has a man's size job. He normally coordinates, supervises and directs the supply services without in any way operating their specialties. Ordinarily these services deal directly with G-4 who settles routine matters in his office and takes up with the chief of staff those that involve new policies. These services, however, may deal directly with the chief of staff and with the commander when necessary. They have therefore been organized into what is called the Technical, Supply and Administrative Staff. This staff includes other than the supply services. The Adjutant, Inspector, Judge Advocate, Chaplain, and the senior commanders of the combatant arms belong to it. It is designed to furnish advice to the commander and his general staff on technical matters and for operation of the services.

Since the Ordnance Department is a non-combatant branch and since the highest tactical ordnance organization is the company, the army, corps, and division ordnance officer is not in command of troops but is essentially a specialized staff officer—a member of the technical, supply and administrative staff.

Some of the technical functions of the Ordnance Department in the theatre of operations are the anticipation, procurement, storage and distribution of ordnance matériel in the amounts and of the character required at the place and time they are needed; the maintenance of ordnance matériel including inspection to determine condition and care and advice as to proper utilization. Directly at the front the division ordnance officer distributes the necessary technical information about ammunition, collects and studies enemy ordnance, inspects ordnance matériel in the hands of troops, sees that all units of the division are informed as to the location of ordnance supply and repair facilities, visits subordinate commanders to determine what difficulties and deficiencies exist so that he may take steps to correct and eliminate them, controls the operations of

the maintenance company, accumulates unserviceable ammunition and duds and recommends locations for Infantry ammunition distributing points.

The other supply services operating under G-4 have similar duties to those of the Ordnance Department in regard to their own supplies. These different supply services—the Quartermaster Department, Corps of Engineers, Signal Corps, Ordnance Department, etc., are like neighbors in business. They are more like departments in a large department store. While they are not competing with each other—each having its own line of goods—hardware, clothing, groceries, etc., yet they are all operating under the same roof. Space must be adjusted, transportation arranged, overhead assigned and many other items of common interest to two or more or to all departments must be settled. Their relations should be friendly and many arrangements of common interest can be made among themselves without resorting to the general manager for settlement. This is exactly what happens in the case of the supply services under G-4. For instance: a road leading forward branches into two roads at about a mile back of the front line. These roads fan forward and at the junction is concealment, shelter and water. This is an excellent place for an infantry ammunition D. P. (distributing point) and the ordnance officer wants it. The quartermaster wants it for a ration D. P. The surgeon wants it for a collecting station—the engineer and signal officer want it and so on. By a friendly conference such a matter can usually be settled without reference to higher authority—otherwise G-4 must make the decision. Hence the relations between members of the technical, supply and administrative staff should be, open, cordial and friendly.

Going back to the analogy of our finger, the quartermaster supplies the blood and skin, the engineer the framework (bone and tissue), the signal corps the nerves and the ordnance the nail. We may even eliminate the the medical corps since the finger is self-repairing. This may be a poor analogy but all analogies are more or less poor and it serves to orient us in our role as ordnance officers in that it illustrates the teamwork into which we must play. We depend upon the quartermaster to transport our supplies, the engineer for roads, bridges, electric light, the signal corps for communications, the medical corps for hospitalization, and so on.

Now for a brief summary. The object of this page this month is to orient ourselves as ordnance officers in the great fighting machine in the theatre of operations. We find that ours is strictly a supply branch, wholly noncombatant. That the energies actuating the military force come under four great heads and that we operate under the fourth—supply. That our supplies are highly specialized and that we have several brothers in the supply business with us all carrying different lines but working for the same firm. That the name of this firm is The Technical, Supply and Administrative Staff, the owner is the Commander, the president is the Chief of Staff and the general manager is the Assistant Chief of Staff, G-4. That while we operate our own department under the manager, the president or even the owner may call upon us for specialized advice concerning our department. Beyond that, we operate independently—estimate our customers' needs, do our own buying, storing and arranging—we go further; we even guarantee to keep in repair articles that have actually been sold. That we must keep on good terms with our brother heads of departments since many interests arise common to all and much can be done by mutual agreement to relieve the general manager of arduous details. That as ordnance officers in the field, SERVICE is our motto and TEAMWORK our middle name.

Who's Who in This Issue

CLAYTON EARL WHEAT is Chaplain at the United States Military Academy, West Point, N. Y. He is a graduate of Sewanee University, an Episcopalean clergyman, a good preacher and an athlete of ability.

* * *

Maj. Gen. Malin Craig, U. S. A., is Assistant Chief of Staff, G-3. He was formerly Chief of Cavalry in which assignment he was recently succeeded by Maj. Gen. Herbert B. Crosby, U. S. A.

* * *

Maj. Gen. Creed C. Hammond, U. S. A., is Chief of the Militia Bureau, War Department, to which office he was appointed June 29, 1925. He enlisted as a private in the Nebraska National Guard in 1898 and served in the Spanish American and World Wars.

* * *

Maj. Gen. Charles P. Summerall, U. S. A., an outstanding figure in the World War, is Commanding General of the Second Corps Area with headquarters at Governor's Island, New York.

* * *

Brig. Gen. Frank T. Hines, Res., is Director of the United States Veterans' Bureau.

* * *

Lt. Col. N. E. Margetts (F. A.), G. S. C., U. S. A., served as war correspondent with the French forces in Morocco during 1925. He is now on duty at the War Department General Staff, Washington, D. C.

* * *

Mr. C. J. Bain is a chemical engineer at Picatinny Arsenal, Dover, N. J.

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With the publication of this—the May-June, 1926—issue, ARMY ORDNANCE completes its sixth volume. An index to Volume VI is being sent all members and subscribers with this issue.

Professional

SMALL ARMS

Forging Armor-Piercing Cores for Caliber .50 Machine Gun Ammunition

ONE of the by-products of the activities of the Ordnance Districts in carrying out the detail work of procurement planning is the discovery and development of improved methods of manufacture for ordnance material.

The contact which the District Offices have with the manufacturers of the country permit the officers engaged in this work to become acquainted with a wide variety of manufacturing operations through personal observation or visits to the various manufacturing establishments in connection with the survey of industrial plants. The process described in this article is an excellent example of the benefits derived from this acquaintance.

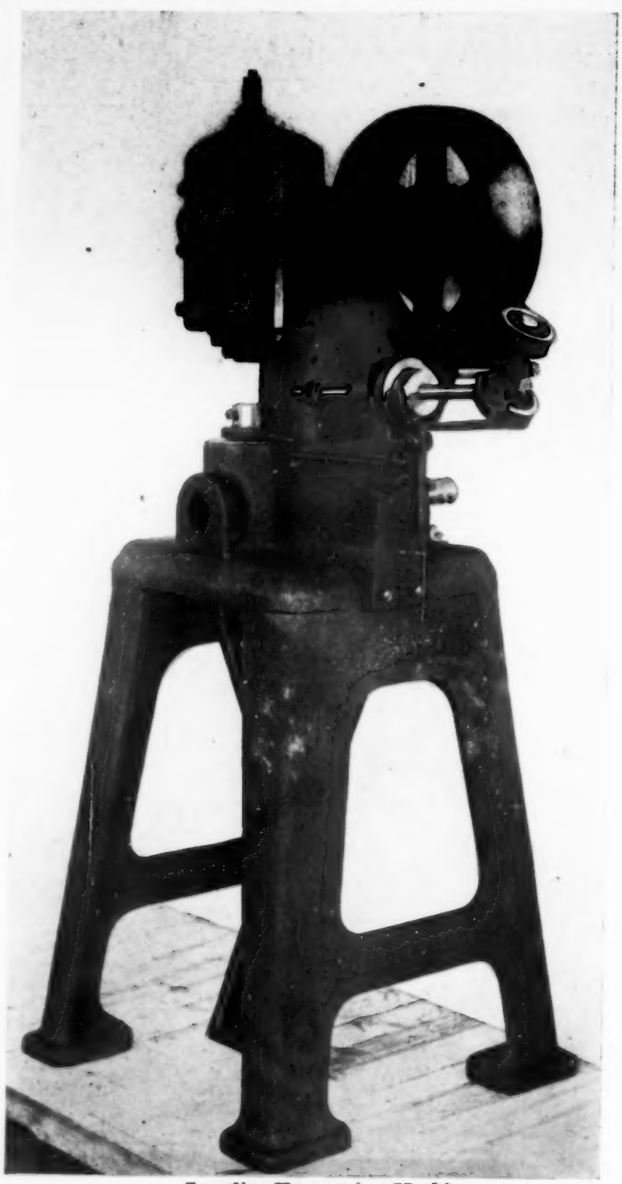
The Caliber .50 Machine Gun has been developed and in a measure perfected since the war and this weapon has now been given a place in our tables of organization. We now have definite requirements, both for this gun and its ammunition in the War Department's mobilization plans. The supply of ammunition for the gun presents a problem which did not exist during the World War. The manufacture of the cartridge case, the primer and the propelling charge present no features which are novel or difficult. The bullet, however, is a diffeernt story.

Practically all ammunition for this machine gun is of the armor-piercing type and each bullet contains a steel core intended to penetrate armor. This core as designed and adopted, is made of tungsten steel and was produced by turning from bar stock on an automatic screw machine. When the problem of providing a supply of this ammunition to meet the mobilization plan was presented to the Districts, the sole source of information regarding its manufacture was Frankford Arsenal, as they had been made at no other place.

The Arsenal had produced a rather satisfactory core which had the proper armor-piercing qualities but trouble was being experienced by the ammunition developing excess pressure during firing. It was found upon investigation that the outside diameter of the core must be kept within very close limits in order to prevent the development of excess pressure. These limits were found to be so small as to be beyond the productive accuracy of a screw machine. The use of a centerless grinder was suggested and Frankford Arsenal secured one of these machines and was able to grind these cores to the required diameter very rapidly and very economically after the final heat treatment, so that the problem of the outside diameter was solved.

The first information as to the rate of production of these cores at Frankford Arsenal was given out as three minutes per core per machine. A rough calculation showed that approximately 1,200 screw machines would be required to produce these cores in the quantities required to meet the mobilization plans.

After some discussion of the subject we began casting about for a more economic and faster method of production. In the meantime Frankford Arsenal having made an intensive study of this production problem was able to reduce the machining time, first to 70 seconds per core and later, as low as 30 seconds. The tolerance on the outside diameter was made more liberal in order to secure the increased production, and the centerless grinder was depended upon to reduce the outside diameter to the prescribed limits.



Langlier Hammering Machine.

The Langelier Manufacturing Company of Providence, R. I., proposed to produce these cores by hot forging from bar stock on one of their hammering machines and after the usual negotiations, Frankford Arsenal placed an experimental order with this company for a sample lot of cores to be produced by their method and subjected to test.

It is thought the readers of ARMY ORDNANCE will be interested in a description of this hammering machine. The actual forging is performed between two halves of a split die. The upper half of the die is mounted on a holder on the top of which is a hardened steel roller. During the operation, this upper half of the die moves upward so that this roller comes into contact with a series of six rollers mounted on the periphery of a rapidly revolving spindle. This action results in a series of rapid but relatively light blows on the upper half of the die. The lower half of the die is carried on a block which can be moved vertically toward the upper die block by means of a foot treadle.

The forging is done from bar stock. The part of the rod to be forged is heated to the required temperature and placed in the holder. This holder contains a hollow spindle equipped with a chuck which seizes the rod and causes it to rotate continually during the forging operation. The operator then presses on the foot treadle and brings the lower die block up against the rod being forged, whereupon the upper die block is brought in contract with the rollers in the periphery of the rapidly revolving spindle. This results in a rapid succession of relatively light blows on the upper die holder and as that portion of the rod between the two dies is heated to a forging temperature and being revolved it quickly assumes the shape of the interior surface of the die.

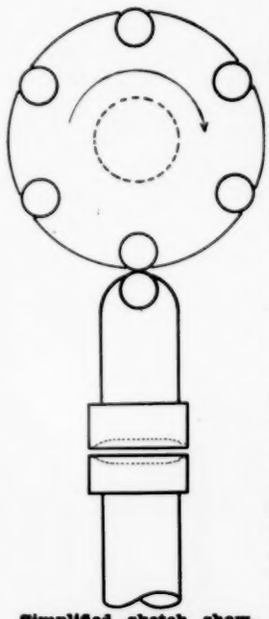
The greater part of the scale due to the heated condition of the metal is broken off and carried from between the dies so that upon completion of this forging operation the metal is of a deep blue color with a very thin coating of scale and a rather highly polished surface. On account of the constant turning of the material in the dies the process becomes self-centering so that the finished forging is uniformally round and symmetrical to a very high degree.

A sufficient number of cores was not produced to definitely determine the diametrical tolerances which might be expected from operating on a large production basis. These cores were forged point foremost and while a perfectly sharp point was not obtained the square portion of the point was not more than .05-inch in diameter.

The forging was then cut off at the base and the core was then ready for heat treatment and the final grinding.

In doing this developing work the Langelier Company experimented first with commercial cold rolled shafting and with drill rod, and excellent results were obtained. However, upon the first trial with the 3½ per cent tungsten steel rods the operator was unable to produce a satisfactory core. This difficulty was due to the characteristic "red hardness" of tungsten steel and after some experimenting, he discovered the proper forging heat for that steel and with some alterations in the dies was able to produce a good core from the tungsten steel.

With the improvised apparatus employed in this first experimental order the Langelier Company was able to forge these cores in about eight seconds actual forging time. Heating was done in a gas-fired furnace. These cores all came within the prescribed tolerances shown on the drawing for screw machine cores and were taken to Frankford Arsenal for heat treatment and loading.



Simplified sketch showing relative position of spindle head, rollers and die blocks in Langelier Hammering Machine.

We have since been advised by Frankford Arsenal that these cores have armor-piercing qualities equal to the turned cores in every respect and the manufacturer is now engaged in the design and development of feed apparatus for this machine for and including continuous heat arrangements whereby the rod will be heated immediately before entering the die.

The high forging temperature of this tungsten steel presents some difficulties which are not thought to be insuperable. Provided the problem of heating the stock is satisfactorily solved it is believed that this method of production will be much superior to the screw machine method of production for the following reasons: (1) The rate of production will be at least four times that of the screw machine; (2) the cost of dies is expected to be much less than the cost of tooling and maintaining screw machines; (3) the amount of scrap resulting from the forging operation will not require more than 65 per cent of the material that will be required to produce the same number of cores by the screw machine process; (4) upon completion of the development of this method for producing the caliber .50 core the caliber .30 core can be produced by the same method. The problem of production will be much simpler since all of the difficulties that were overcome in the development of the manufacture of the caliber .50 core will be much the same with the smaller core. The size of the bar stock required for the caliber .30 core will make the heat problem much easier to solve.

The accuracy of this system of forging is quite astonishing to one who has watched the operation for the first time and it would seem to have a wider application in industry than it receives at the present time.

The further development of manufacture using this process is now in the hands of Frankford Arsenal and it is expected that they will find considerable use for this process in the production of small arms ammunition.

L. P. CRIM,
Capt. Ord. Dept., U. S. A.,
Executive Assistant, Boston Ordnance District.

DISCUSSION

ALTHOUGH the primary object of assigning Officers as Executive Assistants to the Chiefs of the various Procurement Districts is for the purpose of procurement planning and survey of plants with a view of obtaining additional facilities for the manufacture of Ordnance material in case of emergency, it is believed that a great opportunity is presented to these Officers when discussing accepted schedules of production and methods of manu-

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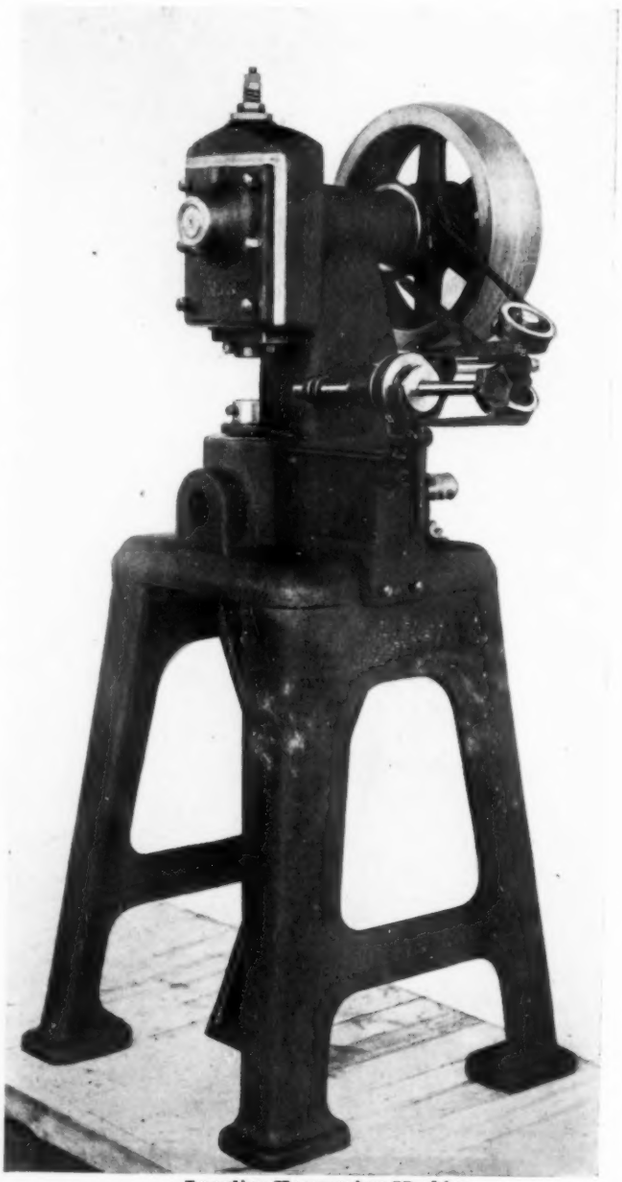

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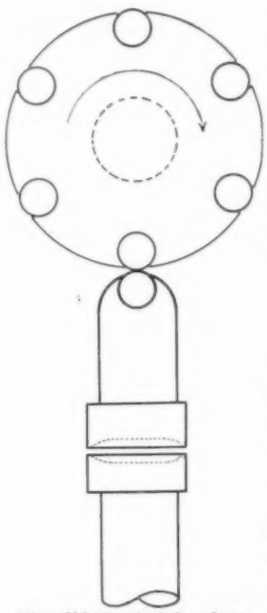

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facture thereunder, to discover or find means for the development of improved methods of manufacture of Ordnance material.

New methods of manufacture, involving less expense, increased production, and utilization of commercial machinery and equipment for Ordnance production, will in many cases be brought to light by a study of the factory plan of the plant concerned and the methods of manufacture which they contemplate using thereunder.

In every case where new methods are found, such as the one reported by Captain Crim, it is suggested that a report be made to the proper Division of the Office of the Chief of Ordnance in order that appropriate action may be taken.

W. L. Clay,
Major, Ord. Dept., U. S. A.,
Chief, Infantry and Aircraft Armament Division,
Office of the Chief of Ordnance.

AMMUNITION

A Sensitive Form of Silver Fulminate

THE preparation and properties of silver fulminate were discused in this journal[1] for September-October, 1925. It was stated that the compound is stable and very similar in its properties to mercury fulminate, and is more effective as a detonating material but its present cost is too high to compete with the mercury compound. Since then, true crystals of the silver fulminate made in the Explosives Chemical Laboratory of the Bureau of Mines have been obtained, and brief notes[2] on their preparation and properties will be given. In 1823, Liebig[3] stated that silver fulminate forms small needles.

Preparation

The following procedure was followed in some special tests:

Silver nitrate weighing 3.1 grams was dissolved in 15 c. c. of nitric acid and 18 c. c. of water. This mixture was added to 30 c. c. of 95 per cent alcohol. When the mixture was heated to 80 or 90° C. the usual product was formed. On one occasion a solution was allowed to stand over a very warm night and apparently the usual yield of silver fulminate was formed, but this product exploded while being washed and filtered.

Other solutions were made of the same concentration and kept at a constant temperature for three weeks. There was no precipitate formed when the temperature was below 30° C., even when the solution was seeded. At 30 to 34° C. a slight precipitate formed in 24 hours, but there was only a small yield after a month.

Properties

This product consisted of a mixture of colloidal aggregates and very small true crystals. These crystals were not large, as might be expected from the rate of formation, and the aggregates were only the usual size. The true crystals could be readily identified at magnifications above 500. They consisted of small rosettes and star-shaped clusters. The crystals were only 0.01 mm. in length and 0.0015 mm. in diameter as compared to 0.2 mm. by 0.01 mm. for the aggregates, yet these small crystals were much more sensitive than the aggregates. Other concentrations would doubtles form crystals at a different temperature.

Conclusions

True crystals of silver fulminate will form under varying conditions of temperature and concentration. These crystals are much more sensitive than the colloidal aggregates even though much smaller. These results show that the conditions of temperature and concentration must be closely controlled during the manufacture of silver fulminate.

C. A. Taylor,
Wm. H. Rinkenbach,
Chemical Laboratory, Explosives Section,
Pittsburgh Experiment Station, U. S. Bureau of Mines.

From War to Peace—Amatol Arsenal Becomes a Race Track

WHAT better metamorphosis could befall an old war-horse—for such indeed was Amatol Arsenal—than to become a place of recreation where the blessings of peace may be enjoyed by the people. Amatol Arsenal, Amatol (near Atlantic City), N. J.—once the scene of gigantic munitions activities, has passed on to its haven of reward and is now the site of a one and one-half mile board speedway. The Board Track Speedway at Amatol, also known as the Atlantic City Speedway, staged its opening race May 1, 1926.

Members of the Army Ordnance Association who knew Amatol during the War will be interested in this announcement. The speedway occupies only a part of the original reservation, and the track itself is located about one-quarter of a mile in the rear of the former administration building. Foundations of some of the old warehouses are included in the area inside the track. Used as a storage depot after the World War, Amatol was abandoned by the Ordnance Department June 30, 1923.

Having fought the good fight, Amatol gives way to the piping times of peace. On with the race!

[1] Taylor, C. A., and Buxton, E. P., ARMY ORDNANCE, Vol. 6, 1925, pp. 118-119.
[2] Published with approval of the Director, U. S. Bureau of Mines.
[3] Von Liebig, J., Ann. chim. et phys., Vol. 24, 1823, pp. 294-317.

Personnel

Edited by Major John A. Brooks, Jr., Military Personnel Section, Office of the Chief of Ordnance

Spring Training for Ordnance Reserve Officers

ASSIGNMENTS of Ordnance Reserve Officers for spring training, 1926, have recently been announced by the Chief of Ordnance. The following officers have been ordered to training at the stations and for the periods indicated:

Aberdeen Proving Ground: Maj. Roger S. Hoar, Ord. Res., June 13 to June 27; 1st Lieut. William L. Allison, Ord. Res., May 16 to May 30.

Rock Island Arsenal: Maj. Colin E. McRae, Ord. Res., June 13 to 27; Capt. William M. Moody, Ord. Res., May 23 to June 6; 2nd Lieut. Temple O. Merchant, Ord. Res., May 16 to 30.

Frankford Arsenal, May 16 to May 30, 1926: Maj. Harold S. Bope, Ord. Res.; Maj. Calvin H. Goddard, Ord. Res.; Maj. Sharpe Ireland, Ord. Res.; Capt. Archibald D. Methven, Ord. Res.; Capt. Henry H. Olmstead, Ord. Res.; Capt. Edward E. Tanguy, Ord. Res.; Capt. Barrett Rogers, Ord. Res.; Capt. David L. Woodberry, Ord. Res.; 1st Lieut. Walter I. Ettleman, Ord. Res.; 1st Lieut. Fred Hanss, Ord. Res.; 1st Lieut. Earl Naramore, Ord. Res.; 1st Lieut. Rufus R. Rosell, Ord. Res.; 1st Lieut. Theodore R. Snyder, Ord. Res.; 2nd Lieut. Edward C. Bopf, Ord. Res.; 2nd Lieut. William M. Croft, Ord. Res.; 2nd Lieut. Frank T. Francis, Ord. Res.; 2nd Lieut. Claude M. Stroup, Ord. Res.

Office of Assistant Secretary of War, Washington, D. C.: Maj. Samuel G. Green, Ord. Res., April 18 to May 2.

Office Chief of Ordnance, Washington, D. C., May 2 to May 16: Maj. Andrew F. Carlin, Ord. Res.; Maj. David P. Gaillard, Ord. Res.; Maj. Jay A. Utts, Ord. Res.

Watertown Arsenal, May 16 to May 30: Maj. Hiram B. Guise, Ord. Res.; Maj. George E. Knable, Ord. Res.; Maj. Harold McGeorge, Ord Res.; Maj. Weaver H. Rogers, Ord. Res.; Maj. Alfred Voysey, Ord. Res.; Maj. Fay B. Williams, Ord. Res.; Capt. Roswell J. Clapp, Ord. Res.; Capt. Vladimir V. de Sveshnikoff, Ord. Res.; Capt. George J. Schladt, Ord. Res.; 1st Lieut. Carroll D. Billmyer, Ord. Res.; 1st Lieut. Edward M. Floreyk, Ord. Res.; 1st Lieut. Charles Hiller, Ord. Res.; 1st Lieut. Tracy C. Kerr, Ord. Res.; 1st Lieut. Joseph A. Llompart, Ord. Res.; 2nd Lieut. Robert C. Ashworth, Ord. Res.; 2nd Lieut. Wayne L. Cockrell, Ord. Res.; 2nd Lieut. Paul E. Holcomb, Ord. Res.; 2nd Lieut. Reynolds F. Kirkwood, Ord. Res.; 2nd Lieut. William H. Palm, Ord. Res.

Watervliet Arsenal, May 16 to May 30: Lt. Col. Isaac Weil, Ord. Res.; Capt. Milford H. Clark, Ord. Res.; 1st Lieut. Floyd M. Bevins, Ord. Res.; 1st Lieut. Kenneth M. Cunningham, Ord. Res.; 1st Lieut. Douglas L Rehlaender, Ord. Res.; 2nd Lieut Michael P. Guida, Ord. Res.

Cincinnati Ordnance District, Cincinnati, Ohio: Capt. Michael H. Ellison, Ord. Res., May 3 to 17; 2nd Lieut. Carlton E. Brown, Ord. Res., May 17 to 31.

109th Engineers, Rapid City, South Dakota: Capt. John O. Kammerman, Ord. Res., sometime in June.

Springfield Armory, May 16 to May 30: Lt. Col. Aaron L. Mercer, Ord. Res.; Maj. Francis W. Parker, Ord. Res.; Maj. Herman L. Wittstein, Ord. Res.

Picatinny Arsenal, May 16 to May 30: Maj. Charles K. Blatchly, Ord. Res.; Capt. Robert W. Blair, Ord. Res.; 1st Lieut. Ernest E. Probyn, Ord. Res.; 2nd Lieut. Warner W. Hall, Ord. Res.

Benicia Arsenal, May 16 to May 30: Maj. Charles J. Rauner, Ord. Res.; Capt. George R. Bliss, Ord. Res.; Capt. Clarence C. Harshman, Ord. Res.; Capt. William E. Robinson, Ord. Res.; 2nd Lieut. Charles B. McDonald, Ord. Res.

Picatinny, Aberdeen and Washington, D. C.: Lt. Col. Arthur W. Ewell, Ord. Res., June 13 to June 27.

Washington, D. C., Frankford Arsenal, Hoboken, N. J., Buffalo D. O. O. and Rochester, N. Y.: Major Floyd K. Richtmyer, June 9 to June 22.

New York Ordnance Reserve Officers Attend Annual Test Mobilization

THE Annual Test Mobilization of the New York Ordnance District was held in the rooms of the American Society of Mechanical Engineers on the 11th floor of the Engineers Building, 29 West 39th Street, on Tuesday, April 6, from 11 A. M. to 6:30 P. M. Ninety-three Reserve Officers reported in person and twenty-five reported by letter, telephone or telegraph.

This Test Mobilization was the climax of the winter's training, which has been carried on by weekly meetings addressed by various officers, and at which problems pertaining to the New York Ordnance District and to the Army as a whole were discussed informally by the officers in attendance.

The mobilization centered around a list of questions, eight of which were drawn by each man reporting, five of these eight to be chosen and answered by him.

At the close of the meeting a dinner was held at the Amateur Comedy Club in New York City, about seventy-five of the Reserve Officers attending. The cloak of officialdom was dropped from the shoulders of the Reserve Officers at the completion of the Test Mobilization and the dinner was a "get-together" affair and proved to be most successful. During the evening half a dozen professional performers entertained the guests.

Colonel Judson Completes Course D, Command and Staff

COLONEL CYRUS FIELD JUDSON, Ord. Res., who completed Course D, Command and General Staff, May 28, 1925, with an excellent rating, is the only Ordnance Reserve Officer and the sixth of the total number of Reserve Officers in the Second Corps Area to complete this course. He received a Certificate of Capacity September 11, 1925. Prior to promotion to his present grade he was assigned as Ordnance Officer, XII Corps.

Col. Judson was called to active duty as Captain, O. R. C., in September, 1917, was promoted to Major in October, 1918, and received his honorable discharge in August, 1919. He was appointed, after the War, Major, Ord. Res., in December, 1919; was promoted to Lt. Colonel, Ord. Res., in September, 1922, and promoted to Colonel, Ord. Res., in December, 1925.

Colonel Judson has taken advantage of every opportunity presenting itself for active duty training and takes an active interest in all Ordnance Reserve work. At the present time he is Works Manager of the Petroleum Heat and Power Company, Stanford, Conn., and resides at Ardsley-on-Hudson, N. Y.

It will be interesting to learn of some other Ordnance Reserve Officers in other Corps Areas who have taken Course D, Command and General Staff.

Group Photograph of Military and Civilian Personnel, Office of the Chief of Ordnance, Taken in Potomac Park, Adjacent to the Munitions Building, Washington, D. C. Lincoln Memorial in the Background.

Maj. Townsend Whelen Promoted

THE promotion of Major Townsend Whelen, Ord. Dept., U. S. A., to be a Lieutenant Colonel was confirmed by the Senate March 30, 1926. Colonel Whelen is Executive Assistant to Brig. Gen. C. L'H. Ruggles, Chief of Manufacture, Office of the Chief of Ordnance, and is an authority on small arms and small arms ammunition.

Hon. W. Stuart Symington, Jr.

HON. W. STUART SYMINGTON, Jr., Judge of the Supreme Court of Baltimore, Md., and former President of the Symington Chicago Corporation, Ordnance manufacturers during the World War, died February 19, 1926, at Baltimore.

A son of the late Maj. W. Stuart Symington, of the Confederate Army, and a graduate of the Johns Hopkins University with degrees of A. B. and Ph. D., Mr. Symington first taught at Leland Stanford University, California, and thereafter for some years was Professor of Romance Languages at Amherst. In 1906, after studying law at Columbia University, and the University of Maryland, he was admitted to the Maryland Bar and practiced law in Baltimore until 1917. Upon the outbreak of the War, despite the fact that he was forty-five years of age, Mr. Symington sought to enlist in the Army, but was rejected on account of his age.

One of his brothers was naval attaché at the Court of St. James in London at the outbreak of the war. Another brother was in the military service in France. His brother T. H. Symington organized the Symington Corporation shortly after the outbreak of the war to manufacture 75-mm. field guns and high explosive shells at Rochester, New York. At the request of the Ordnance Department the Symington organization built and operated a plant in Chicago to produce 155-mm. high explosive shells. Mr. Symington suspended his practice of law in Baltimore and was sent to Chicago as President of the Symington Chicago Corporation where he was in charge of the direction and equipment of this work. This plant was 85 per cent completed and 15 per cent equipped when the Armistice was signed. The President of the Corporation immediately and on his own responsibility, stopped work, cancelled all sub-contracts, and by this procedure saved the government an enormous expense.

Shortly after the Armistice, the Comptroller of the Treasury ruled that thousands of contracts made by the War Department were invalid because not executed in the manner required by the Revised Statutes. This ruling produced chaotic conditions in the settlement of Ordnance contracts, and it became necessary to obtain remedial legislation from Congress. Mr. Symington, cognizant of the situation, was one of the few individuals who, on their own initiative called at Cleveland on January 2, 1919, a meeting of the principal contractors for similar work and individuals holding uncompleted contracts with the War Department.

At that meeting was organized the Association of Manufacturers of War Materials, of which Mr. Symington was unanimously elected President. Thereafter he was responsible for the success of the Association's efforts in bringing to the attention of Congress the facts in the situation which were responsible for the passage of the Dent Act, whereunder the vast majority of Ordnance contracts was settled by the War Department.

His war work completed, Mr. Symington resumed the practice of his profession in Baltimore and in the summer of 1924, was appointed by the Governor of Maryland, to the Supreme Bench of Baltimore City, and as a Judge thereof, served until his death.

Retirement of Maj. James H. Keough, Ord. Res.

UPON his retirement from the Ordnance Reserve March 4, 1926, Maj. James H. Keough, 52 Christmas Street, Wakefield, Mass., was highly commended for his many years of service by Maj. Gen. C. C. Williams, Chief of Ordnance, U. S. A.

For the past thirty-eight years, Major Keough has been most active in instruction in small arms practice and in the encouragement of rifle shooting not only in Massachusetts but throughout the United States. His work

during the World War in connection with small arms maintenance merited the high esteem and commendation of his superiors.

Washington Section, A. S. M. E., Holds National Defense Meeting

THE Washington Section, American Society of Mechanical Engineers, held a National Defense meeting March 12, 1926, at the Cosmos Club, Washington, D. C. Members of the Washington Post of the Army Ordnance Association were invited to participate as also were the members of the local section of the Society of American Military Engineers.

Col. Hanford MacNider, Assistant Secretary of War, was the principal speaker, who addressed the gathering on "Industrial Preparedness." Col. Wm. H. Tschappat, Ord. Dept., U. S. A., Chief of the Technical Staff, Office of the Chief of Ordnance, gave an illustrated lecture.

Mr. Arthur Adelman, President of the Washington Section, A. S. M. E., presided. Mr. Adelman is Assistant Chief of the Ammunition Division, Technical Staff, Office of the Chief of Ordnance, and is an active member of the Army Ordnance Association.

National Guard Ordnance Officers

THE following names and addresses of Ordnance Officers of the National Guard were compiled under the direction of Maj. James B. Gillespie, Ord. Dept., U. S. A., who is on duty in the Office of the Chief, Militia Bureau, Washington, D. C.

The Editor purposes to publish changes in personnel of National Guard Ordnance Officers from time to time and requests that any changes or omissions in the following list be brought to his attention.

Alabama:

Maj. William Vans Murray Robertson, Jr., State Staff, 2026 First Ave., Birmingham, Ala.

Arizona:

Capt. Paul Lee Lambert, Ord Res., State Staff, care Adjutant General's Office, Phoenix, Ariz.

Arkansas:

Maj. James Tittle, State Staff, 803 Willow St., Little Rock, Ark.

2nd Lt. Hunter D. Scott, State Staff, 312 Palm St., Little Rock, Ark.

California:

Lt. Col. Joshua B. Dickson, State Staff, West End of West St., Petaluma, Calif.

1st Lt. George Robert Hilby, State Staff, Executive Mansion, Sacaramento, Calif.

Colorado:

Lt. Col. Joseph Wilt LeFever, 45th Div., Hdqrs. 45th Infantry Div., Denver, Colo.

Capt. Raymond W. Combs, State Staff, 225 South College Ave., Fort Collins, Colo.

Capt. Joseph E. Moorhead, 45th Div., 1421 Champa St., Denver, Colo.

Connecticut:

Lt. Col. Robert Foster Gadd, State Staff, 76 Kenyon St., Hartford, Conn.

Delaware:

Capt. John Bachmann Grier, State Staff, Rockland, Newcastle, Del.

District of Columbia:

Capt. Just Cesillius Jensen, State Staff, 2204 Evarts St., N. E., Washington, D. C.

Georgia:

Maj. Wm. T. Spratt, Jr., State Staff, care Spratt Chair Co., Atlanta, Ga.

Hawaii:

Capt. Francis Xavier, State Staff, 3951 Kaiauki Ave., Honolulu, T. H.

Idaho:

Capt. Carl H. Butler, State Staff, P. O. Box 687, Caldwell, Idaho.

Illinois:

Lt. Col. Stuart Menzies Murdoch, State Staff, 11247 Lothair Ave., Chicago, Ill.

Lt. Col. Charles William Nunan, 33rd Div., 408 N. Elm St., Champaign, Ill.

Indiana:

Lt. Col. Basil Middleton, 38th Div., Culver, Ind.

1st Lt. Albert Black, State Staff, 401 E. Main St., Albion, Ind.

Iowa:

Lt. Col. Fred S. Hird, 34th Div., Hickman & Merle Hay Rd., Des Moines, Ia.

Maj. Robert L. Fulton, State Staff, Fairfield, Ia.

Kansas:

Maj. Samuel Amos McKone, State Staff, Lawrence, Kans.

Kentucky:

Maj. Blaine Short, State Staff, Jackson, Ky.

2nd Lt. Albert Watkins Blanton, State Staff, Highland Ave., Jackson, Ky.

Louisiana:

Capt. Harry Wilkinson Eckhardt, State Staff, New Orleans, La.

Maryland:

Maj. George Henderson, State Staff, 519 Washington St., Cumberland, Md.

Massachusetts:

Lt. Col. Charles Cleveland Stanchfield, 26th Div., 30 Winthrop St., Chelsea, Mass.

Maj. Nathaniel Cushing Nash, Jr., State Staff, 1 Reservoir St., Cambridge, Mass.

Capt. Harry Reynolds Marshall, State Staff, 16 Chesley Road, Newton Centre, Mass.

1st Lt. Rudolph Joseph Thanisch, State Staff, 200 Bellevue St., W. Roxbury, Mass.

Michigan:

Lt. Col. Harry Elmore Loomis, State Staff, 84 W. Main St., Battle Creek, Mich.

1st Lt. Paul Vivian Engstrom, State Staff, care Buick Motor Co., Flint, Mich.

Minnesota:

Lt. Col. Richard Edwin Cotton, State Staff, 1795 Lincoln Ave., St. Paul, Minn.

1st Lt. Albert E. Nollet, State Staff, Box 197, St. Paul Park, Minn.

Mississippi:

Capt. Daniel A. Linthicum, State Staff, Greenwood, Miss.

Missouri:

Lt. Col. Claude Callahan Earp, State Staff, 626 So. Adams St., Nevada, Mo.

Nebraska:

Capt. Herbert McPheely Potter, State Staff, 1535 So. 22nd St., Lincoln, Neb.

New Hampshire:

Capt. George Ruthven Bowman, State Staff, 53 Beacon St., Laconia, N. H.

New Jersey:

Lt. Col. Charles William Stark, 44th Div., 216 S. Warren St., Trenton, N. J.

1st Lt. Walter Emil Soltmann, State Staff, 149 N. Warren St., Trenton, N. J.

New Mexico:

Capt. Hilanio Amado Delgado, State Staff, Elks Club, Albuquerque, N. Mex.

New York:

Lt. Col. Edward Jenkins Parish, State Staff, 75 Chestnut St., Oneonta, N. Y.

Lt. Col. Frederick Martin Waterbury, 27th Div., Room 829, Municipal Bldg., New York, N. Y.

Maj. Henry Edward Suavet, State Staff, 707 96th St., Woodhaven, L. I., N. Y.

Maj. Clarence S. Martin, State Staff, 141 W. 8th St., Oswego, N. Y.

Capt. Timothy S. Mahoney, State Staff, 133 Madison St., Brooklyn, N. Y.

Capt. Frank Elliott Rasbach, 102nd Ord. Co., Special Troops, 35 Alsop St., Jamaica, N. Y.

1st Lt. William James Coleman, State Staff, 227 Norman Ave., LaSalle, N. Y.

2nd Lt. George Joseph Volze, 102nd Ord. Co., Special Troops, 168 Sherman Ave., New York, N. Y.

North Carolina:

Maj. Edney Ridge, State Staff, Greensboro, N. C.

North Dakota:

Capt. Marshall Durell Jones, State Staff, Lisbon, N. D.

Ohio:

Lt. Col. Gibson Don Light, 37th Div., 231 Islington St., Toledo, Ohio.

Lt. Col. George P. Zwerner, State Staff, 374 Abbott Ave., Columbus, Ohio.

Maj. John Edwards, State Staff, 1940 Sullivant Ave., Columbus, Ohio.

Capt. Morris Pennock Keith, 112th Ord. Co., Special Troops, Kingsway, Alliance, Ohio.

Capt. Max L. Zwerner, State Staff, 988 Heyl Ave., Columbus, Ohio.

2nd Lt. Charles Marion Conaway, 112th Ord. Co., Special Troops, 734 Walnut Ave., N. E., Canton, Ohio.

Oklahoma:

Lt. Col. Earl Wayne Whitney, State Staff, Wewoka, Okla.

Capt. Samuel Jeff Carr, 120th Ord. Co., Special Troops, Claremore, Okla.

1st Lt. Herbert Clinton King, State Staff, 720 S. Grand Ave., Okmulgee, Okla.

2nd Lt. Fred Arthur Schweikhard, 120th Ord. Co., Special Troops, Claremore, Okla.

Oregon:

Maj. Roy R. Knox, State Staff, 828 East 1st St., Albany, Ore.

Pennsylvania:

Col. Walter Carleton Sterling, State Staff, 72 So. River St., Wilkes Barre, Pa.

Lt. Col. Samuel D. Foster, State Staff, 6526 Darlington Road, Pittsburgh, Pa.

Lt. Col. Franklin P. Haller, Jr., 28th Div., Woodland Ave., Folcroft, Pa.

Maj. Raymond A. Brown, State Staff, State Arsenal, Harrisonburg, Pa.

Capt. William Malvern Fox, 103rd Ord. Co., Special Troops, E. Flourtown Ave., Wyndmoor, Pa.

Capt. Josiah Pratt Wilbar, State Staff, 222 Yale St., Harrisburg, Pa.

2nd Lt. Charles Henry Middleton, 103rd Ord. Co., Special Troops, 2129 So. 65th St., Philadelphia, Pa.

Porto Rico:

Capt. Carlton Swiggett, Jr., State Staff, 7 Calle Palmas, Santurce, P. R.

Rhode Island:

Capt. Archer F. Williams, State Staff, 216 New York Ave., Providence, R. I.

South Carolina:

Capt. Ben M. Sawyer, State Staff, 3100 Devine St., Columbia, S. C.

South Dakota:

Capt. William Zwicky, State Staff, Rapid City, S. D.

Tennessee:

Maj. Edward Baxten Sweeney, State Staff, 506 Stahlman Bldg., Nashville Tenn.

2nd Lt. James Gilbert Sterchi, Jr., State Staff, 418 Gay St., Knoxville, Tenn.

Texas:

Lt. Col. Eldred Bailey LaRue, State Staff, Athens, Texas.

Maj. Horace Henry Carmichael, State Staff, Three Rivers, Texas.

Capt. Leon W. Perkins, State Staff, 4308 Ave. G, Austin, Texas.

Vermont:

Lt. Col. George Ethelburt Carpenter, 43rd Div., Waterbury, Vermont.

Virginia:

Lt. Col. Sidney Travis Moore, 29th Div., Wytheville, Va.

Maj. LeRoy Hodges, State Staff, Governor's Office, Richmond, Va.

2nd Lt. William B. Jackson, State Staff, State Rifle Range, Virginia Beach, Va.

Wisconsin:

Maj. George Lane Simpson, State Staff, 321 McKinley Ave., Eau Claire, Wis.

1st Lt. Fred Caffrey, State Staff, 4115 Elm St., Milwaukee, Wis.

Wyoming:

Capt. Ferne Mauless Schmalle, State Staff, Tarrington, Wyo.

Recently Commissioned Ordnance Reserve Officers

THE following have accepted reserve commissions since the last issue of ARMY ORDNANCE:

Lt. Col. Eldred B. LaRue, Ord. Res., Athens, Tex.

Maj. Nelson Emmons, Jr., Ord. Res., R. R. No. 16, Dayton, Ohio.

Maj. Ralph E. Parker, Ord. Res., Ridgley Apts., Birmingham, Ala.

Maj. Roger B. Whitman, Ord. Res., 314 Nassau Blvd., Garden City, N. Y.

Capt. Theodore A. Distler, Ord. Res., 1904 Loring Place, New York, N. Y.

Capt. George R. Ensminger, Ord. Res., 141 Codwise Ave., New Brunswick, N. J.

Capt. Stephen D. Monahan, Ord. Res., 1212 Central St., Evanston, Ill.

Capt. Edward A. Wagner, Ord. Res., 4333 Drury Lane, Fort Wayne, Ind.

1st Lt. John L. Christie, Ord. Res., R. F. D. Box 10, Fairfield, Conn.

1st Lt. Lester C. Dibble, Ord. Res., 444 National Bank Commerce Bldg., Lincoln, Nebr.

1st Lt. Carroll D. Hudson, Ord. Res., P. O. Box 36, Llewellyn Iron Works, Los Angeles, Cal.

1st Lt. John H. Johnson, Ord. Res., 26 Campfield St., Irvington, N. J.

1st Lt. Frank L. Leonard, Ord. Res., 17 Park Apts., Cincinnati, Ohio.

1st Lt. Arthur H. Nordstrom, Ord. Res., 1734 New York Ave., N. W., Washington, D. C.

1st Lt. William A. Schrader, Ord. Res., 210 Oakwood Ave., Rockford, Ill.

1st Lt. Cecil A. Stearns, Ord. Res., 2320 Sixth Ave., Troy, N. Y.

2nd Lt. Harry Barrows, Ord. Res., 21 Warren St., Revere, Mass.

2nd Lt. Charles Clauss, Ord. Res., South 4th St., Ridgefield Park, N. J.

2nd Lt. Carroll W. Elliott, Ord. Res., 62 Pleasant Ave., Montclair, N. J.

2nd Lt. Ernest Gaskins, Ord. Res., Willacoochee, Ga.

2nd Lt. Edward T. Hetzler, Ord. Res., 3 & 5 Place Vendome, Paris, France.

2nd Lt. Howard H. Josephs, Ord. Res., 496 Crofton Ave., Oakland, Cal.

2nd Lt. William A. F. Millinger, Ord. Res., 1864 North Ave. 51, Los Angeles, Cal.

2nd Lt. Anton Remaitis, Ord. Res., P. O. Box 2187, Salt Lake City, Utah.

2nd Lt. Justin W. Russell, Ord. Res., 18 Brunswick St., Pittsfield, Mass.

2nd Lt. Robert C. Watkins, Ord. Res., Box 400, Piedmont Ave., Atlanta, Ga.

2nd Lt. Marion N. Watson, Ord. Res., 411 N. 5th Ave., Rome, Ga.

Reappointed Ordnance Reserve Officers

THE following reserve officers have accepted reappointment in the Ordnance Department Reserve:

Col. Herbert H. Lehman, Ord. Res., 16 Williams St., New York, N. Y.

Lt. Col. Hardee Chambliss, Ord. Res., 3401 16th St., N. E., Wasington, D. C.

Lt. Col. Archibald B. Hubard, Ord. Res., Elkins Park, Pa.

Lt. Col. Harry W. Miller, Ord. Res., Room 447, Engineering Bldg., Univ. of Mich., Ann Arbor, Mich.

Lt. Col. James M. S. Waring, Ord. Res., 140 Nassau St., New York, N. Y.

Maj. Franz S. Blue, Ord. Res., Motor Finance Corp., Commerce Guardian Bldg., Toledo, Ohio.

Maj. Louis E. Brittson, Ord. Res., 333 Graham Ave., Highland Park, N. J.

Maj. Jacob S. Buist, Ord. Res., 126 Ea. Maple Ave., Moorestown, N. J.

Maj. Andrew F. Carlin, Ord. Res., 10 Gordon St., Allston, Mass.

Maj. Michael T. Carney, Ord. Res., 59 Parsons St., Brighton, Mass.

Maj. Marcus F. Cooper, Ord. Res., Delaware Ord. Res. Depot, Pedricktown, N. J.

Maj. Royal B. Daggett, Ord. Res., 34 Lafayette St., White Plains, N. Y.

Maj. Alexander Dow, Ord. Res., American Car and Foundry Co., 165 Broadway, New York, N. Y.

Maj. Charles E. Ellis, Ord. Res., Mahwah, N. J.

Maj. Clarence M. Foss, Ord. Res., 263 Amity St., Flushing, N. Y.

Maj. Marcus G. Gallimore, Ord. Res., 55 Gillis Road, Cradock, Va.

Maj. Ralph L. Goetzenberger, Ord. Res., 8016 Flourtown Road, Chestnut Hill, Philadelphia, Pa.

Maj. Sheldon D. Graff, Ord. Res., 21 Gammons Road, Waban, Mass.

Maj. Hiram B. Guise, Ord. Res., 184 High St., Boston, Mass.

Maj. Edward P. King, Ord. Res., Watervliet Arsenal, Watervliet, N. Y.

Maj. Malcolm F. Loomis, Ord. Res., 92 Iroquois Road E., Pontiac, Mich.

Maj. John B. McLennan, Ord. Res., 1644 No. Moody Ave., Chicago, Ill.

Maj. Anthony Poyet, Ord. Res., U. S. Nitrate Plant No. 2, Muscle Shoals, Ala.

Capt. Warren C. Beasley, Ord. Res., Route No. 2, Box 43A, Vancouver, Wash.

Capt. Clay O. Bradley, Ord. Res., Augusta Arsenal, Augusta, Ga.

Capt. Bernard Cain, Ord. Res., R. F. D. No. 1, Davis Co., Farmington, Utah.

Capt. Charles Carey, Ord. Res., U. S. National Museum, Washington, D. C.

Capt. Harvey A. Clark, Ord. Res., Route 1, Box 153, Cherry Way, Hayward, Cal.

Capt. Robert G. Cook, Ord. Res., 157 E. Roosevelt Blvd., Philadelphia, Pa.

Capt. George A. Dingee, Ord. Res., Ordnance Office, Ft. Sill, Okla.

Capt. Thomas S. Downing, Ord. Res., Torresdale, Philadelphia, Pa.

Capt. Ralph Handel, Ord. Res., 1014 N. Jackson St., Glendale, Cal.

Capt. James M. Hassett, Ord. Res., 712 St. Paul St., Baltimore, Md.

Capt. Harry O. Holt, Ord. Res., 237 Grattan St., San Francisco, Cal.

Capt. John Johnson, Ord. Res., Erie Ordnance Reserve Depot, LaCarne, Ohio.

Capt. Thomas W. Jones, Ord. Res., P. O. Box No. 11, Route A, Ravendon, Ark.

Capt. Frederick H. Keller, Ord. Res., care Calumet & Arizona Mining Co., Valedon, N. Mex.

Capt. Patrick McCue, Ord. Res., Raritan Arsenal, Metuchen, N. J.

Capt. John McDonald, Ord. Res., Ogden Arsenal, Utah.

Capt. Charles H. McKnight, Ord. Res., 45 Lowell Road, Schenectady, N. Y.

Capt. Alonzo C. Marsh, Ord. Res., Columbus Barracks, Ohio.
Capt. Charles B. Mellen, Ord. Res., P. O. Box 162, Setauket, L. I., N. Y.
Capt. Charles S. Moore, Ord. Res., Raritan Arsenal, Metuchen, N. J.
Capt. John K. Murphy, Ord. Res., Fort Shafter, Hawaiian Dept., T. H.
Capt. Maurice O'Donnell, Ord. Res., Benicia Arsenal, Benicia, Cal.
Capt. George H. Osborne, Ord. Res., Fort Banks, Winthrop, Mass.
Capt. Dick R. Reed, Ord. Res., 94 So. Oxford St., Brooklyn, N. Y.
Capt. Charles G. Toepper, Ord. Res., 3822 8th St., N. W., Washington, D. C.
Capt. George E. Tufts, Ord. Res., 170 Lincoln St., Newton Highlands, Mass.
Capt. Harry R. Wilson, Ord. Res., Watervliet Arsenal, Watervliet, N. Y.
1st Lt. Edwin L. Davis, Ord. Res., 4616 30th St., N. W., Washington, D. C.
1st Lt. John P. Diehl, Ord. Res., 1013 Oakland Ave., Madison, Wis.
1st Lt. Charles Weppman, Ord. Res., Erie Proving Ground, LaCarne, Ohio.
2nd Lt. George R. Swett, Ord. Res., Fort Barrancas, Fla.

Recently Assigned Ordnance Reserve Officers

THE following reserve officers have recently been assigned as indicated after their names:

Lieut. Col. Eldred B. LaRue, Ord. Res., Territorial Assignment Group.
Maj. Nelson Emmons, Jr., Ord. Res., Manufacturing Service, Cincinnati District Ordnance Office, Cincinnati, Ohio.
Maj. Ralph E. Parker, Ord. Res., Manufacturing Service, Birmingham District Ordnance Office, Birmingham, Ala.
Maj. Roger B. Whitman, Ord. Res., Manufacturing Service, New York District Ordnance Office, New York, N. Y.
Capt. Edward B. Anschutz, Ord. Res., Manufacturing Service, Bridgeport District Ordnance Office, Springfield Armory, Springfield, Mass.
Capt. Arthur N. Armitage, Ord. Res., Manufacturing Service, San Francisco District Ordnance Office, San Francisco, Cal.
Capt. Theodore A. Distler, Ord. Res., Manufacturing Service, New York District Ordnance Office, New York, N. Y.
Capt. George R. Ensminger, Ord. Res., Manufacturing Service, Picatinny Arsenal, Dover, N. J.
Capt. Stephen D. Monahan, Ord. Res., Manufacturing Service, Small Arms Division, Washington, D. C.
Capt. Claude K. Shedd, Ord. Res., Technical Staff, Aberdeen Proving Ground, Md.
1st Lt. Wayne W. Cowan, Ord. Res., Manufacturing Service, New York District Ordnance Office, New York, N. Y.
1st Lt. Lester C. Dibble, Ord. Res., Territorial Assignment Group.
1st Lt. Carroll D. Hudson, Ord. Res., Manufacturing Service, San Francisco District Ordnance Office, San Francisco, Cal.
1st Lt. Frank L. Leonard, Ord. Res., Territorial Assignment Group.
1st Lt. William A. Schrader, Ord. Res., Manufacturing Service, Chicago District Ordnance Office, Chicago, Ill.
1st Lt. Cecil A. Stearns, Ord. Res., Territorial Assignment Group.
2nd Lt. Harry Barrows, Ord. Res., Territorial Assignment Group.
2nd Lt. Henry Chippendale, Ord. Res., Manufacturing Service, Boston District Ordnance Office, Boston, Mass.
2nd Lt. Charles Clauss, Ord. Res., Territorial Assignment Group.
2nd Lt. Carroll W. Elliott, Ord. Res., Territorial Assignment Group.
2nd Lt. Edward T. Hetzler, Ord. Res., Manufacturing Service, New York District Ordnance Office, New York, N. Y.
2nd Lt. Thomas S. Hubbard, Ord. Res., Manufacturing Service, Buffalo District Ordnance Office, Watervliet Arsenal, Watervliet, N. Y.
2nd Lt. William J. Lanier, Jr., Ord. Res., Manufacturing Service, Chicago District Ordnance Office, Chicago, Ill.
2nd Lt. William A. F. Millinger, Ord. Res., Territorial Assignment Group.
2nd Lt. Anton Remaitis, Ord. Res., Territorial Assignment Group.
2nd Lt. Justin W. Russell, Ord. Res., Manufacturing Service, Bridgeport District Ordnance Office, Springfield Armory, Springfield, Mass.
2nd Lt. Edward J. Waterman, Ord. Res., Manufacturing Service, Rock Island Arsenal, Rock Island, Ill.
2nd Lt. Robert C. Watkins, Ord. Res., Territorial Assignment Group.
2nd Lt. Marion N. Watson, Ord. Res., Territorial Assignment Group.
2nd Lt. Lysle A. Willits, Ord. Res., Manufacturing Service, Frankford Arsenal, Philadelphia, Pa.

District of Columbia Ordnance Reserve Officers Banquet

ORDNANCE Reserve Officers of the District of Columbia held their second annual dinner Monday, March 8, 1926, at which Brigadier Generals C. L'H. Ruggles and John W. Joyes, Assistant Chiefs of Ordnance, and Col. John Scott, Executive Officer of the Washington Organized Reserves, were the guests of honor. Lt. Col. Isaac Weil, Ord. Res., acted as toastmaster.

Preceding the dinner a lecture on "Design of New Types of Artillery" was given by Maj. B. W. Simpson, Ord. Dept., U. S. A. Following the dinner, General Ruggles addressed the officers on "The Functioning of the Ordnance Department in Times of Peace and War," and General Joyes spoke of the duties of an Ordnance Reserve Officer during mobilization and training periods. Colonel Scott complimented the officers on their faithful attendance at the regular Monday evening lectures which have been conducted at Reserve Headquarters, Washington, during the past two years. Sixty officers were present. Capt. M. H. Resni-Coff was chairman of the committee in charge.

Training for Pacific Coast Ordnance Reserve Officers

THE first training period for this year for Ordnance Reserve Officers on the Pacific Coast will be held May 16th-30th, at Benicia Arsenal and in San Francisco. The program has been arranged with a view to making it an interesting one for the Ordnance Reserve Officer and to cover in a general way all of the activities of the Department. Reserve officers in the branch assignment group, assigned to the San Francisco Ordnance District and to Benicia Arsenal will be ordered to active duty.

The program at Benicia Arsenal includes a two-day, overnight practice march with the 59th Ordnance Company. The program in San Francisco includes attendance at the 5th semi-anual war game of the San Francisco Ordnance District. The spring luncheon of the California Post of the Army Ordnance Association will be held on May 25th; and visits to the plant of the Caterpillar Tractor Company in San Leandro and to the Ordnance Unit at the University of California are a part of this program. Under the supervision of the Corps Area Ordnance Officer, the officers will visit the Ordnance and Artillery activities connected with the Harbor Defenses of San Francisco including the heavy batteries, mining casemates, target range, etc.

Partial program for this training period follows:

May 17 (Monday)

8:00 to 12:00—Physical examination; general inspection of Arsenal; Talk, "Organization and Functions of Benicia Arsenal," Major Partridge.
1:15 to 1:40—Drill.
1:45 to 4:30—The 155-mm. Howitzer. Dismantle, examine liquid and air (nitrogen) cylinders, pistons and recoil control. Reassemble, fill with liquid and air; tests to determine liquid level and air pressure; safety features; obturation; adjustmnt of sights. Lieut. Hirsch.

May 18 (Tuesday)

8:00 to 12:00—Property Accountability and Responsibility; Receipts, Shipment and Issue of Property; Expendable Property; Lost, Damaged or Unserviceable Property; Property Records; Blank Forms Pertaining to Property Accounting. (Note: Instruction by discussion, problems and use of forms.) Mr. O'Donnel.
1:15 to 1:40—Drill.
1:45 to 4:30—Inspection of storage and issue of ordnance supplies; Groups A, B, C, D, E, F, G, H, I, J, K and L (Storehouses 71, 69, 64, 49); Storage, inspection, checking and packing property; disposition of unserviceable property; inventories; marking shipments. Mr. Bowerman.

May 19 (Wednesday)

8:00 to 9:15—The Ordnance Provision System, Mr. Gieffels.
9:30 to 10:30—Talk and discussion, "Organization of a Field Army, Army Corps and Infantry Division with special reference to the organization of the Ordnance office and duties of the Ordnance officer of each of these units." Major Partridge.
10:30 to 12:00—Inspection of mobile shop equipment of the Ordnance Maintenance Company (Light and Heavy). Lieut. Hirsch.
1:15 to 1:40—Drill.
1:45 to 2:15—Talk, "Ammunition Supply in Peace and War," and description of depots and parks. Major Partridge.
2:15 to 4:30—Inspection of ammunition magazines; methods of storage; safety rules; types of magazines; breaking down unserviceable small arms ammunition; destruction of "dud" and unserviceable ammunition. Lieut. Hirsch.

May 20 (Thursday)

8:00 to 9:00—Talk, "Arsenal Administration." Mr. Mann.
9:15 to 9:45—Ordnance Drawings. Mr. Mendler.
10:00 to 12:00—Five-ton tractor and six-ton tank material. Capt. Merrill.
Afternoon—Recreation.

May 21 (Friday)

8:00 to 12:00—Small arms shop. Repair of rifles, pistols, machine guns, automatic rifles, etc., including such problems as assembly of new rifle barrel to receiver; fitting and adjusting new front sight to rifle; star gaging; determination of leaks and soldering of water jacket on Browning machine gun; bluing and browning of rifles, etc. Capt. Merrill. Mr. Eversole.
3:00 to 4:30—Demonstration firings of automatic rifle, machine gun, 3-inch Stokes trench mortar and 37-mm. gun. Capt. Merrill.

May 22 (Saturday) and May 23 (Sunday)

Preparation for road march. March to Rockville; camp; field depot; return.

May 24 (Monday)

9:15 to 9:30—Report at Room 237 Merchants Exchange Building, 465 California St., San Francisco, to Major Brett.
9:30 to 10:30—Lecture, "Industrial Mobilization," by Major J. A. Dorst, C. E., San Franciso Procurement District.
11:30 to 12:00—Conference—Mobilization Plans of San Francisco Ordnance District, Administration and Small Arms Divisions.
2:00 to 4:30—War Game, Small Arms Division; Artillery Division.

May 25 (Tuesday)

9:15 to 9:30—Report at Room 237 Merchants Exchange Building, San Francisco, to Major Brett.
9:30 to 10:30—Lecture, "Ordnance Procurement," by Major Brett.
11:00 to 12:00—Conference, Mobilization Plan of the San Francisco Ordnance District; Artillery Division and Ammunition Division.
12:15 to 1:30—Luncheon, California Post, Army Ordnance Association, at Commercial Club, 13th floor, Merchants Exchange Bldg., 465 California St., San Francisco.
2:00 to 4:30—War Game, Ammunition Division.

May 26 (Wednesday)

9:15 A. M.—Report at Room 237, Merchants Exchange Bldg., 465 California St., San Francisco, to Major Brett.
9:30 to 10:30—Lecture, "Ordnance Explosives and Propellants," by Lt. Col. F. L. M. Masury, Ord. Res., Chief, Ammunition Division.
11:00 to 12:00—Lecture, "Steel Manufacture on the Pacific Coast—Ordnance Steels," by Dr. W. J. Crook, Prof. of Mining and Metallurgy, Stanford Univeresity.
1:00 to 4:30—Visit to plant of Caterpillar Tractor Co., San Leandro, Cal., Report to Major W. A. Capron at Company's Office.

May 27 (Thursday)

For the morning session, the class will be divided into two sections.

1st Section

9:15 A. M.—Report at Ordnance District Office, 58 Sutter St., San Francisco.
9:30 to 10:30—Conference—Correspondence School Courses for Ordnance Officers, Colonel Masury, Ord. Res.
10:30 to 11:30—Conference—Organization and Operation of the San Francisco Ordnance District—Major Brett, Office, San Francisco Ordnance District, 58 Sutter St., San Francisco.

2d Section

9:15 A. M.—Report to Ordnance Officer, 9th Corps Area, Presidio of San Francisco.
9:30 to 11:30—Organization and Operation of Corps Area Ordnance Office, Corps Area Supply Methods—Major T. J. Hayes, Ordnance Officer, 9th Corps Area.

Afternoon Session for Both Sections

1:00 to 2:00—Presidio of San Francisco—Report to Ordnance Officer, 9th Corps Area—Lecture, "Ammunition," by Capt. H. E. Minton, Ord. Dept.
2:15 to 4:30—Visit to Ordnance Storehouses, Harbor Defenses, Mining Casemates, Target Range.

May 28 (Friday)

For the morning session, the class will be divided into two sections.

1st Section

9:15 A. M.—Report to Ordnance Officer, 9th Corps Area, Presidio of San Francisco.
9:30 to 11:30—Conference, Organization and Operation of Corps Area Ordnance Office, Corps Area Supply Methods, Major T. J. Hayes, Ordnance Officer, 9th Corps Area.

2d Section

9:15 A. M.—Report at Ordnance District Office, 58 Sutter St., San Francisco.
9:30 to 10:30—"Correspondence Courses for Ordnance Officers," Lt. Col. F. L. M. Masury, Ord. Res.
10:30 to 11:30—Conference, Organization and Operation of the San Francisco Ordnance District—Major Brett.

Afternoon Session for Both Sections

1:00 to 2:00—Presidio of San Francisco—Report to Ordnance Officer, 9th Corps Area—Lecture, "Recent Developments of Ordnance Material," Major T. J. Hayes, Ordnance Officer, 9th Corps Area.
2:15 to 4:30—Visit to Ordnance Storehouses, Coast Defenses, Mining Casemates, Target Range, etc.

May 29th (Saturday)

9:15 A. M.—Report at Office, San Francisco Ordnance District, 58 Sutter St., San Francisco. Critique on Training Period—Submission of Individual Reports.
11:00 A. M.—Fort Mason—Settlement of Pay and Mileage Accounts.

Patents

Brief Descriptions of Inventions of Interest to Ordnance Engineers

Compiled by W. N. Roach, Chief, Patent Section, Office of the Chief of Ordnance

RECENT patents pertaining to Ordnance include the following:

Ammunition

Frank T. Crowell, of Picatinny Arsenal, has been granted patent No. 1,570,620, for a mechanical delay element for fuzes. This element consists of a member, adapted to be inserted in a standard fuze, comprising a cylindrical portion, suitably threaded, on one end of which is mounted a striker and on the other end the primer casing is carried. The striker is adapted to be rotated by the threads, the pitch of the threads determining the amount of delay.

Patent No. 1,570,983 has been granted to Pieter D. Van Essen, assignor to the Bethlehem Steel Company, for a safety device for high explosive fuzes and projectiles. The invention consists of a chamber in the booster charge or main explosive charge, which chamber is filled with a chambered plastic or resilient material adapted to damp the waves of detonation. The chamber in this material forms a seat in which the detonator is normally located, the detonator being moved from the chamber into communication with the booster or main explosive charge when the shell strikes or during flight. The material specifically set forth in the patent as a damper is paraffin wax.

Preston R. Bassett, assignor to Elmer Sperry, has been granted patent No. 1,571,617, for an aerial flare bomb. This patent discloses a flare adapted to be supported in the air by a parachute normally housed within the tail of the flare and released from the flare during flight by a clock-work mechanism, the flare being ignited by release of the parachute casing from the flare proper.

John S. Barker has secured patent No. 1,571,131, for a mechanical time fuze. This patent discloses a mechanical time fuze in which the firing mechanism is moved with respect to the tripping arm to set the fuze, which structure allows the tripping arm to be permanently connected to the main shaft of a clock-work mechanism.

Patent No. 1,577,075 has been granted to Earl C. Pitman and George F. Hunter, assignors to E. I. duPont de Nemours & Co., for a proces for removing coloring matter from smokeless powder. The process consists essentially in extracting the powder with alcohol, preferably hot, to remove the diphenylamine, then subjecting the powder to the action of dilute hydrochloric acid containing 0.05 to 15 per cent of HCl, then treating the powder with alcohol to extract practically all the remaining coloring matter.

Andre Varaud has been granted patent No. 1,577,391, for a clock-work for a mechanical fuze for artillery projectiles. The clock-work disclosed in this patent contains a cylindrical balance spiral arranged transversely in the fuze and preferably perpendicular to the axis of rotation of the projectile, a support upon which the spiral rests momentarily upon firing of the projectile from the gun and a dead beat escapement which makes it possible to give the balance oscillations of relatively large amplitude.

Artillery

Alfred J. Auspitzer has been granted patent No. 1,571,117 for a device for the adjustment of the side angle of sighting instruments. The device consists of a graduated disk adapted to be attached to and moved with the object whose side angle is to be adjusted, a pointer cooperating with the graduations on said disk, a disk provided with correction graduations concentric with the first disk, an anchorage member, a flexible shaft between the disks and anchorage member and a suitable level attached to the first mentioned disk.

Patent No. 1,571,391 has been granted to Julius Becker, assignor to Fried Krupp, for a sighting device for guns. This device is intended for use in guns mounted on a moving base, and consists of the ordinary gyroscopic mounting used with the sights of such guns, the difference being that in this device the outer Cardan axis is adjustable to the elevation to be given to the axis of the gun barrel, whereby the errors in adjusting the gun which are due to the inclination of the trunnions are eliminated for every range.

James B. Henderson has been granted patent No. 1,575,606, for a sighting device. This patent covers a device for use on moving platforms in which the sighting device is controlled by a gyroscope, which in this instance is held under strain by two opposed springs. Upon roll of the platform these springs cause the gyroscope to precess about its trunnion axis through an angle proportionate to the velocity of the roll of the platform, which movement will automatically cause electrical contact to be made to fire the gun at a time which includes the correction necessary to compensate for the roll of the platform.

Eugene Schneider, assignor to Schneider et Cie, and Joseph L. Routin, have been granted patent No. 1,576,367, for an apparatus for controlling fire against aerial objectives. The main object of the invention, as disclosed by the patent, is to provide an apparatus for directing and controlling the fire of antiaircraft guns which comprises means for mechanically and electrically recording and compounding ballistic data, when actuated by members of the fire control party. It includes means connected with the recording media, for transmitting directly to indicators located adjacent the gun or guns, this corrected data including windage corrections. The apparatus also includes means interposed between the indicators and the training and pointing mechanisms of the gun or guns, whereby,

when the gun or guns, are laid to the proper angles of elevation and train, the pointers of said indicators will occupy certain predetermined positions.

Clarence H. Froelich, assignor to the Bethlehem Steel Company, has been granted patent No. 1,576,962, for an obturator operating mechanism for guns. This patent discloses a laterally sliding breech block composed of front and rear wedge-shaped blocks and a lever for operating the blocks. This lever is connected to the rear block and has a movable fulcrum connection with the front block, whereby, upon operation of the lever, the rear block is moved laterally of the gun in one direction. The front block is thus retracted and upon further movement of the lever, is moved laterally of the gun in an opposite direction thereby exposing the bore of the gun.

Mr. Froelich and Earl J. Miller, assignors to the Bethlehem Steel Company, have been granted patent No. 1,576,963 for a hydraulic recoil mechanism for guns. This patent discloses a recoil mechanism having specific hydraulic throttling means for checking counter-recoil.

Small Arms

Patent No. 1,569,856 has been granted to Johann E. Eriksen, for an automatic pistol. This patent discloses a pistol of the reciprocating breech bolt type in which a single resilient element is used for returning the breech bolt to breech locking position and actuating the hammer, the breech bolt and hammer being initially retracted by a finger grip provided on the pistol grip. Automatic action is had by holding the usual trigger in its retracted position.

Joseph E. Virdin has been granted patent No. 1,560,901, for an attachment to fire arms. This attachment consists of a bracket attachable to the stock of a fire arm which carries a shoulder rest adapted to engage the left shoulder of one firing the arm.

Crawford C. Loomis, assignor to Remington Arms, Inc., has been granted patent No. 1,571,592, for an automatic pistol. This invention is designed to permit the easy removal of the uppermost cartridge from the magazine and insertion thereof into the cartridge chamber. This is accomplished by proper inclination of the magazine, by suitably inclining the rearward portion of the magazine ears and by providing a specific cartridge contracting member on the breech block which thrusts the cartridge from the magazine into the cartridge chamber.

John E. Glaser has been granted patent No. 1,571,776, for a magazine for fire arms. This patent discloses a specific form of follower adapted to retain the breech bolt in retracted position when the last cartridge has been fired.

Patent No. 1,571,975, for a fire arm, has been granted to Carl G. Swebilius, assignor to Marlin Fire Arms Corporation. This patent discloses a novel form of extractor and ejector.

Mr. Swebilius, assignor to Marlin Fire Arms Corporation, has been granted patent No. 1,572,450 for an automatic rifle. The main object of this invention appears to be the provision of a gas-operated automatic rifle of simple construction in which cooperative members are assembled in separate assemblies or units so that the gun may be quickly taken down and assembled.

Patent No. 1,573,405 has been granted to George S. Lewis and Earl P. Smith for a rifle. The invention relates to various details of construction designed to produce a simple, easily manufactured rifle containing few parts.

Patent No. 1,573,515, for a rear sight for high velocity weapons, has been granted to John W. Harkom. The invention consists in providing a sighting member having front and rear openings in optical alignment, between which openings is a cavity of such dimensions that cross rays of light do not interfere with the sharp definition of objects viewed through the apertures. The rearmost aperture is a cylindrical bore of such length and diameter that the shooter is compelled to use a line of sight coincident with the axis of the aperture in order to obtain clear vision, whereby substantially correct aim is attained.

Charles Sutter, assignor to *Societe Anonyme Des Anciens Establissmements Hotchkiss et Compagnie*, has been granted patent No. 1,573,655, for a firing regulator for automatic firearms. In this device a fly-wheel is used which is actuated by a pivoted lever engaged by the reciprocating member when the latter moves backward. The fly-wheel, during the time of its rotation, holds a sear in elevated position, which sear retains the reciprocating member in rearward position. The pivoted lever is mounted on a shaft the position of which may be changed to vary the relative positions of the lever and reciprocating member, whereby the amount of motion transmitted to the fly-wheel may be varied or such motion completely eliminated.

Charles D. Meyer has been granted patent No. 1,577,055, for a rifle. The patent discloses specific details of construction of the breech bolt mechanism designed to render the same more rapid, safe, convenient and efficient in operation.

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Books

The Campaign of 1864 in the Valley of Virginia and the Expedition to Lynchburg. By H. A. duPont. New York: National Americana Society. 1925. $2.50.

PERHAPS there is no part of the Civil War about which so much controversy has arisen as the Campaign of 1864 in the Shenandoah Valley, partly because such nationally prominent figures took part, as General Phil Sheridan, General of the Armies of the United States, William McKinley and Rutherford Hayes, later Presidents of the United States, John B. Gordon and H. A. duPont, later Senators in the National Congress of long and distinguished service, and also partly because of the Sheridan stories, which have added so much in poetry and prose to the Friday afternoons in our public schools. Senator DuPont, the author of this volume, has now outlived nearly all of the leaders of this important phase of the war. Having read all the stories of the other leaders and thought over the matter all these years, he now puts in the last word as accurately and concisely as possible. Certainly great weight should be given to his arguments, not only because he was an eye-witness of all the events that took place, but because he was an eye-witness in the advantageous position of Chief of Artillery during a great part of this campaign.

In his book, he has taken great trouble to produce accurate maps and sketches, accurate references for all quotations, exact times of movements and exact words of orders and commands. In this respect, he has made a distinct contribution to history.

He also takes time to discuss the reasons for the decisions of commanders; to carefully describe the terrain as it appeared during the battles; to sum up all the knowledge in the commander's possession upon which the decisions were made; and to give all the little details which affected the movement of the various units of the army throughout this campaign. In this respect, he has made a fine contribution to military art.

He takes time to describe the personalities of his commanders and their previous records, to give a background to their actions. He does not spare them in any way, either in their shortcomings and mistakes of judgment prior to coming under his observation, or in the development of their work in the Valley Campaign. He speaks fearlessly and sharply, without mental reservation.

He does not omit to bring out that remarkable element of the Civil War which strikes every reader of those histories, the great intimacy which had previously existed between many of the officers on opposing sides of the conflict. In this particular campaign, many of the opposing leaders had been classmates and roommates at West Point or intimate friends in the regular service. The author himself had been an intimate friend for four years at West Point of General Ramseur, of the Confederate Army. In the Battle of Cedar Creek, Ramseur was captured after he had been mortally wounded. DuPont hastened to his side, saw the look of friendship in his fading eyes, grasped his outstretched hand and held it affectionately until the grasp softened, then laid back the dying arm across the breast of his friend, with many tears. DuPont speaks with equal sadness of old friends and classmates falling on one side or the other. No war stories can possibly carry the pathos of the accounts of these battles between brothers and loving friends.

I believe every soldier who has studied the Civil War during the past fifty years has had personal testimony from one or more of its leaders as to the conduct of its campaigns and battles, and has had opportunity to read a great number of stories by various students of these campaigns. Personally, I have talked over this campaign with General Wilson of the Confederate Service, Mrs. John B. Gordon, wife of General Gordon, and lived for a considerable period next door to General J. K. Kent, one of the world's finest and most unassuming soldiers, whose record in the Civil War, in the Indian Wars and in the War with Spain speak loudly enough without need of any personal, written testimony from him. On a side porch at Watervliet Arsenal, in the afterglow of a summer sunset shining through the stately elms, I have listened in rapture to tales of these same battles of which DuPont has spoken. General Kent fought over those stirring times with his beloved Sixth Corps as if it were yesterday. In almost the same words in which DuPont recalls the Battle of Winchester, I have heard General Kent picture the position of the commander; the difficulties of the Nineteenth Corps; his direction to DuPont to move out to the right; the fall of Russell; the action of Upton; and the final success. He similarly pictured the Battle of Cedar Creek and the difficult situation in which his Corps found itself at the time of the sudden attack of the Confederate forces. General Kent never wrote this down, but I think it should be added here to the testimony of DuPont concerning the conduct of these battles. The other stories which I have heard from General Wilson and Mrs. Gordon have corroborated in large measure many of the points which General DuPont has brought out.

DuPont has written a worthy and delightful book which should be in the military library of every soldier and of every admirer of those who fought through this long Civil War for what they believed to be right.

C. G. METTLER.

Commanding an American Army. By Hunter Liggett. Boston and New York: Houghton Mifflin Company. 1925. $2.00.

WHEN the World War began in 1914, General Hunter Liggett commanded the 4th Infantry Brigade in Texas and occupied his time in preparing his brigade for service in Mexico in case military occupation should become neces-

sary. His ability to command was demonstrated in this task and paved the way for his selection to high command in the new armies thrown into France when the United States entered the World War. Successively, a Division, Corps, and finally an Army Commander, he took an important part in assuring the victory of the Allied Arms.

It is therefore of great interest to the military student to learn that General Liggett has written his recollections of the War. He divides his book into eight chapters, dealing first with the years 1914 to 1918 and modestly indicating his own activities during that period. Then follows an account of the formation of the First Corps and of its participation in the second Marne campaign. The Saint Mihiel and Meuse-Argonne campaigns are next presented in careful detail. Finally, an account is given of the formation and administration of the new Third Army at the Coblenz bridgehead. As a fitting ending to his recollections, the author gives his views on military matters. Four appendices carry operation orders.

The book is well written and on a parity with the memoirs of other famous leaders in our history. It can be cordially recommended on its merits to the military student who desires to know more of one of our best known World War Generals.

E. E. MacMorland.

The Usages of the American Constitution. By Herbert W. Horwill. New York: Oxford University Press. 1925.

THE thesis adopted by Mr. Horwill in this very interesting book, which, while apparent on each of the 243 pages, is definitely put in these words at its very close: "The change that has thus been wrought in the system of his own national government is little realized by the American citizen. Again and again the Fundamental Law has been nullified in practice by judicial interpretation, by sheer neglect to carry out its provisions, and by the accretion of usages which, even if they observe it in the letter, do violence to its intention and spirit."

As the author states in his preface, he has written a volume on the conventional usage that have evolved under the Constitution, a subject that in all researches has been little considered by other authors. Even Lord Bryce, in his *American Commonwealth*, devotes only a few pages to what Mr. Horwill has expanded into a book. With truely Oxonian ability, this English author has analyzed a very curious phase of our Constitution. At the very start he nails as a misnomer that old favorite passtime of school marms—male and female—that America's is a written Constitution and England's an unwritten one. After reading what the author has to say on this subject, none should ever make this serious mistake again.

He then outlines a great many of the usages which have become accepted matters of law but which are often at direct variance with the provisions of the Constitution. Notably the system of presidential electors, which today by usage is an absolute dead letter. What he terms "accidental presidents," meaning those who succeed to the presidency through the death of their predecessors, is both original and startling. He claims that a vice-president who succeeds to the presidency is, under the Constitution, not a president at all but merely an acting president. His logic is inescapable but usage has made it otherwise.

He then goes on to discuss the purpose of the president's cabinet, which by the way is not provided for at all under the Constitution; the appointment and removal of cabinet and other executive officers, the fundamental difference between the American and English systems of a representative being a resident of his district and a great many other less important but equally interesting changes in our constitutional provisions.

It is a fine thing for someone other than an American citizen to give time and research to such questions as these. The perspective with which he views them and the authenticity with which they are stated must make the American reader sit up and take notice. Some of us may regret to see many of our customs which we had always thought strictly constitutional mere traditional usages which only time and popular opinion have sanctioned. On a great many of the subjects considered there are, of course, two sides, but Mr. Horwill has stated his side so accurately that one must perforce agree with him and maybe lament that we are not a government entirely of law but of law and custom.

L. A. Codd.

Peace and Goodwill in Industry. By Stanley Baldwin. New York: The Dial Press, Inc. 1925. 75c.

PERHAPS the largest economic problem in industrial England of today is that of unemployment. Where a million persons are without work and must be taken care of by the Government, it is natural that a primary problem for any Prime Minister is that of so improving industrial conditions as to transfer the recipients of the public doles to the payroll of private industry where they belong.

Various panaceas for England's industrial ills have been proposed and to date there has been little improvement by the patient. The present Prime Minister, Mr. Baldwin, has his own ideas on the subject and has expanded them clearly in the three speeches which form this little book. The salvation of England lies in industrial peace, not in governmental subsidies. A spirit of class selfishness and mutual hatred between masters and men is at the root of the present difficulties. When mutual cooperation for the "common purpose of elevating our people" is substituted for these degenerating influences, we may then expect industrial recovery, and it is the expansion of this idea which forms the theme of each of the speeches. Whether this panacea is any more effective than those of the past yet remains to be revealed.

Mr. Baldwin has a clear oratorical style which never leaves any question as to the meaning intended. The three speeches are no doubt a good cross section of the political mind of the present governing power in England and should be of interest to the student of English polities.

E. E. MacMorland.

Economics of Our Patent System. By F. L. Vaughan. New York: The Macmillan Company. 1925. $2.50.

THE patent laws of the United States, together with the Rules and Regulations of the Patent Office promulgated for the purpose of carrying out such laws, constituting our patent system, have been the subject of much comment and discussion, both favorable and otherwise, but it is rather novel to find a discussion of such system from an economic standpoint. The present volume provides this novelty.

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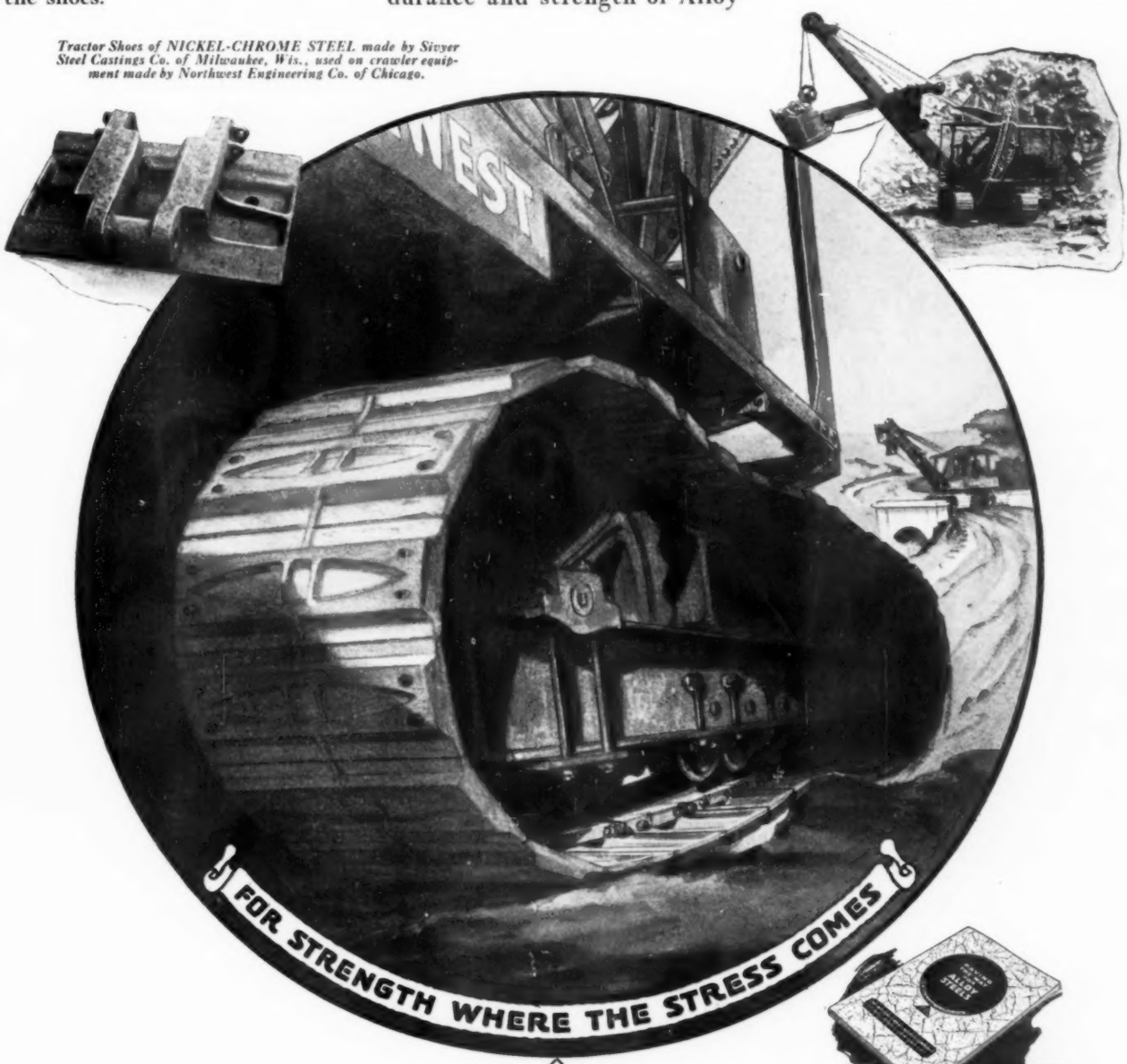

"Paving the Way for Alloy Steels" an interesting booklet on Alloy Steel's development will be mailed free on request to manufacturers of steel or steel products.

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The work is one which makes exceedingly interesting and informative reading for the manufacturer, inventor, and, especially, the patent attorney, as it provides in one volume a practically complete collection of the various evils resulting from dealings in patents and the various remedies that have been proposed from time to time. The work shows the result of extensive research and investigation on the part of the author.

Our patent system and the ideas underlying it are set forth together with the fact that its intent and purpose are thwarted in that the inventor is not the one who profits from his invention, thereby encouraging other inventors, but the profits accruing from the average invention of merit are enjoyed by the wealthy manufacturer.

The author also points out the system of patent pools, patent consolidation, suppression of patents, unfair competition growing out of ownership of patents, together with other evils which he seems to look upon as evils necessarily resulting from our patent system.

The question of remedies for the evils is next taken up, these remedies consisting in the application of the Sherman and Clayton antitrust laws to patent monopolies, lessening the number of patents issued by having a more thorough search of the prior art during the prosecution of patent applications, necessitating a large increase in the Patent Office force, the establishment of a Court of Patent Appeals, and various other changes in our patent laws which have been suggested from time to time with the idea of bettering the patent situation.

While the work is well worth any one's study, it is hardly possible for one to agree with the idea that the ills set forth are the result of our patent system. Many of them, such as the failure of the inventor to realize from his invention, patent pools, etc., are the result rather of economic conditions than of any inherent defect in our patent system.

The author is to be congratulated on having undertaken a worth while work, since there are evils existing which should be cured, and a thorough discussion of such evils, especially by such as the author, whose mind is not warped by too close an association with patent matters, will tend to bring about proper remedies for these evils rather than hasty and ill considered legislation in regard thereto.

W. N. Roach.

American Society for Testing Materials, Tentative Standards, 1925. Philadelphia: Headquarters of the Society. Paper, $7.00; cloth, $8.00.

THE term "tentative standards" as distinguished from "standards," as used by the American Society for Testing Materials, is applied to a proposed standard which is printed for one or more years with a view to eliciting criticisms of which the Committee concerned will take due cognizance before recommending final action toward the adoption of such tentative standards by formal action of the Society.

The Standards and Tentative Standards of the American Society for Testing Materials are recognized as authoritative in the field of engineering materials. The high standing of the Society and of its previous work is so well known among executives and engineers that mere notice of the appearance of the Standard is, we believe, ample proof of their quality. Suffice it here to record that the Tentative Standards for 1925 include the following: 24 relating to steel, ferro-alloys and wrought iron, 17 to non-ferrous metals, 20 to cement, lime, gypsum and clay products, 16 to preservative coatings, 21 to petroleum products and lubricants, 45 to road materials, 3 to coal and coke, 5 to timber, 9 to waterproofing, 8 to insulating materials, 4 to shipping containers, 3 to rubber products, 8 to textile materials, 2 to slate, and 9 to miscellaneous.

L. A. Codd.

Military Operations. Compiled by Brig. Gen. J. E. Edmonds. New York: The Macmillan Company.

IN these days of gigantic armaments the writing of military history is a colossal task. Historical writings on the World War form a library in themselves, but most of this writing has been of unofficial nature and few of the General Staffs of the belligerent powers have produced an official account of the operations of their troops. The British General Staff has begun the publication of the operations of the far-flung British forces in the World War under the direction of General Edmonds of the Historical Section, and the two volumes at hand begin the task by treating the year 1914. Many more will have to follow to cover the huge field involved.

The account given is based entirely on official documents and first hand information, including war diaries, operations orders, official reports, personal interviews with officers taking part, and private diaries. The concurrent operations of the French and Belgian armies are also worked into the text from official accounts derived from these sources. Of great interest also is the use of enemy accounts

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for each engagement to permit of the proper perspective for the reader in evaluating the results obtained. Maps are used extensively. In the text are various "sketches" which give enough detail for the casual reader. Another set of more detailed maps for students of war is issued separately.

VOLUME I

This volume covers the period from the beginning of mobilization to the middle of October, 1914, a period of only two and a half months. It begins with an account of the military situation of the principal belligerent powers at the time of the outbreak of war. This is followed by a concise recital of the events leading up to the various declarations of war, and the dispatch of the Expeditionary Force to France. The Belgian and French operations are covered in great detail for this period. Maubeuge and LeCateau next claim attention when the British Army concentrates in this area. We then follow them into action in this vicinity, and reluctantly see the gallant force pushed back by superior numbers. The retreat then begins, only to end weeks later near Paris on the Seine. The retreat itself is always recognized as a military masterpiece and the account given in this volume almost takes it out of the realm of historical writing into that of epic poetry. Of primary interest is the account of the heroic action of small organizations, always more interesting than the more ponderous evolutions of corps and armies.

The tide now turns and the weary British formations start north again. The pursuit continues to the Aisne and there reaches the point where the dreary trench warfare of the following years was to be fought. The volume ends with the extension of the belligerent armies to the northward in the "Race to the Sea." The end of the race for the British found them in Flanders where they were destined to fight many another battle before the victory in 1918.

The actual narrative is supplemented by many useful appendices carrying operations orders and other documents of interest and by "retrospects" of the battles summing up the events treated.

VOLUME II

This volume begins with an introduction covering the expansion of the army, the control of the British war policy, the munitions situation, the problem of housing, equipping, and supplying the armies, and the steps taken to capture the German colonies. The critical munitions situation is well explained by the conceptions of the various General Staffs as to the nature of any European conflict; that is,

"In the plans and preparations of the General Staffs of the French and German Armies in the years preceding the outbreak of war, there is the clearest evidence of the unanimous belief that a European conflict would be of short duration. General Von Moltke, the Chief of the German General Staff, considered that one great battle would decide the issue, and so confident were the French of a rapid decision, that in the matter of armament they had only made arrangements for repairing existing material, believing that there would be no time for the construction of new weapons.

"In the British General Staff it was assumed that only the Expeditionary Force would be permitted to embark for the Continent and it was considered that provision should be made for four great battles in the first two months of war, each lasting three days. The organization of the supply of the fighting troops was arranged in accordance with this scale."

The text of this volume is devoted to the battles of Antwerp, LaBassée, Armentieres, Messines, and Ypres, and covers October and November, 1914. Trench warfare began at the end of this period for the British. The British participating in the operations around Antwerp, and the retreat of the Belgian Army and the Fourth British Corps to Ypres form the subject of the first chapter, and the introduction to the battles in the vicinity of Ypres. The remainder of the volume deals with the fierce and almost continuous fighting in the Ypres area, lasting until the middle of November. Every detail of the various engagements is covered with exact and painstaking care. We still have our interest held by the action of small units and even the heroic performance of individuals. The determined efforts of the excellent German troops of 1914 to break the salient and the equally stubborn resolution of the weary British troops to throw them back form an epic worthy of the heroic era.

The volume closes with a retrospect of the Ypres battles which sums up briefly the principal events. Appendices carry the most important operations orders, and many maps amplify the text.

This history can be recommended to the military student as the most accurate and complete account of the British participation in the World War yet published. When all volumes have been issued it will no doubt become a standard reference in every library.

E. E. MACMORLAND.

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The main drive consists of a Westinghouse 2300 s.hp., 100 rpm., double armature motor, and power is supplied by three 840 b.hp., Ingersol-Rand Diesel engines driving Westinghouse generators. The exciters, switchboard, auxiliary motors and control were also furnished by Westinghouse.

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Aeronautical Meteorology. By Willis Ray Gregg. New York: The Ronald Press Company. 1925. $2.50.

THE publication of a book on aeronautical meteorology seems to us both timely and necessary. Mr. Willis Ray Gregg, Meteorologist of the U. S. Weather Bureau, has performed this important function as his contribution to the Ronald Aeronautic Library which, under the editorship of Lt. Col. C. deF. Chandler, has undertaken to supply a need for comprehensive literature on aeronautic subjects due to their increasing importance in all the leading nations of the world.

Colonel Chandler, himself a retired officer of the U. S. Army, and one of the pioneer balloon and aviation pilots of the country, has done well in the selection of the author for the treatment of this topic. Possibly his experience as Commanding Officer of the First Army Aviation School at College Park, Maryland, and later Chief of the Balloon Section for the American Expeditionary Forces in France, has assisted in his broad viewpoint in the selection of authors.

The matters discussed by the author seem to be very complete and authentic. Beginning with a few concise definitions, chapters are devoted to discussions of the general circulation of the atmosphere, the common meteorological and aerological instruments and methods of observation. In discussing the vertical structure of the atmosphere considerable data are given on temperatures, humidities, and winds. Then follow discussions and photographs of cloud formations, including fog. The value of the charts showing the relative height, frequency of different cloud formation as computed at Blue Hill, Mass., should be of great value to those interested in the bombing phases of aviation. Not the least interesting portion of the book is that devoted to the procedure of weather forecasting and some of the better founded weather proverbs.

We feel that this book, the contents of which have been merely indicated above, should find worthwhile use in the hands of ordnance engineers and aviators whose function is the design and efficient operation of bombs and instruments connected therewith.

J. R. Knox.

Records of Clan Campbell. By Major Sir Duncan Campbell of Barcaldine, Bt. New York: Longmans, Green & Co. 1925. $4.50.

"THE Campbells are coming, o-ho, o-ho," has reverberated down the years gaining momentum and fame for the ancient Clan Campbell. Probably no greater service has been performed for that noble group than the compilation of Major Sir Duncan Campbell of Barcaldine, Bt., C. V. O., F. S. A. Scot., F. R. G. S., who has gathered into one volume the records of the Clan in the military service of the Honourable East India Company from the years 1600 to 1858.

The military history of the two hundred and fifty-one years of the Clan Campbell under the Honourable East India Company is that of the Company itself. The garrisoning of the principal and outlying settlements in the days after a firm foothold had been obtained, the struggle for supremacy with the French, the deeds of Clive and Stringer Lawrence, the Mysore, Maratha, Burmese, Afghan, and Sikh Wars, together with the various expisodes of the Mutiny, all find echo in Major Campbell's historic work.

C. P. Pollard.

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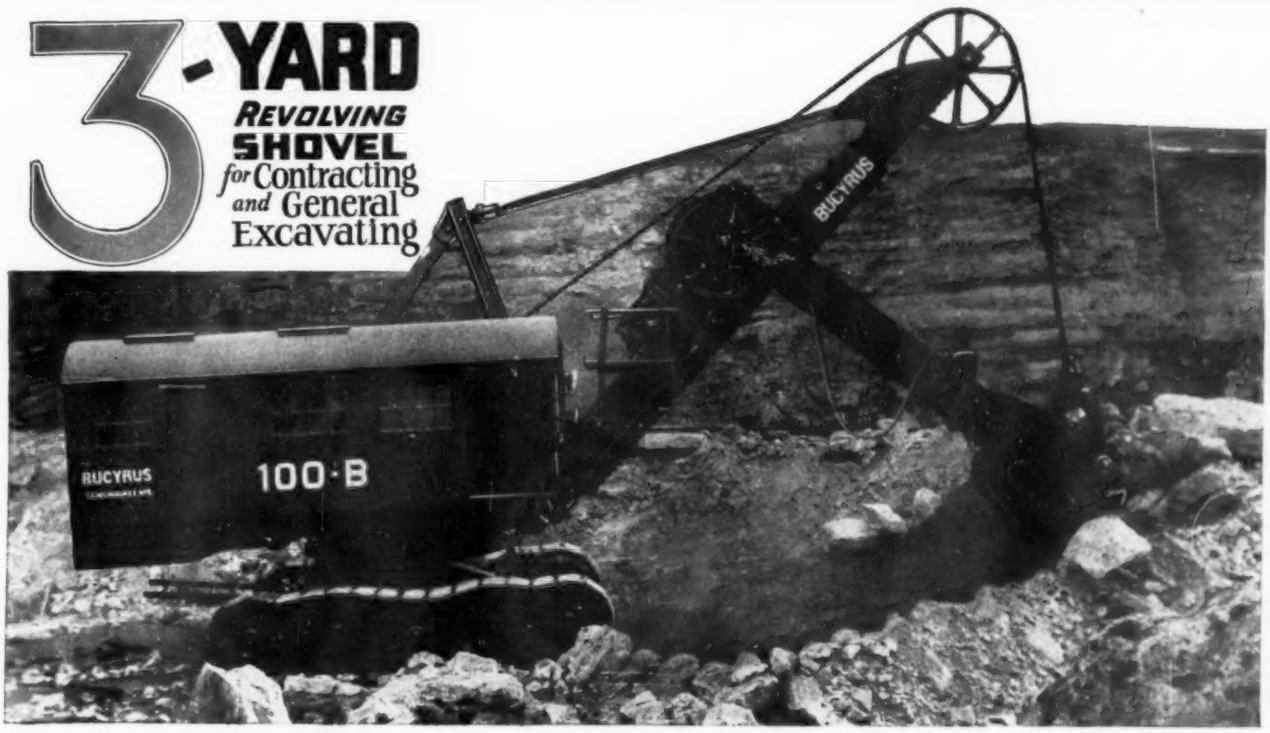

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